CONTRACT FARMING AS FRICTIONAL EQUILIBRIA: A THEORETICAL PERSPECTIVE WITH EMPIRICAL EXCURSIONS IN INDIA

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Abstract

This study makes a case for theorizing contract farming as institutions that operate over a domain, rather than as mere technical arrangements for risk sharing between two economic actors. It advocates using the contract farming system as a unit of analysis and dismantling the composite principal-agent problem into its constituent stages, of contracting, of honoring agreed contracts and of contract enforcement. Each of these stages contains elements of friction that define the substantive features of the arrangement. Contract farming then emerges and sustains as frictional equilibria over the domain, where in the face of uncertainty and imperfect information, firm and farmers develop and update robust subjective assessments regarding the other's behavior and use these to make decisions on whether to contract and whether or not to honor the contract. This approach admits the possibility of incorporating the heterogeneity of contracting experiences, of incorporating the social aspects of transactions and acknowledging explicitly the dynamic elements of these arrangements. Theorizing contract farming as institutions allows a framework that can potentially resolve many apparent contradictions regarding the normative implications of contract farming. The empirical part of this study takes this theoretical apparatus to investigate five contract farming schemes in southern India, broiler, cotton, gherkins, marigold and papaya, using a unique data for 822 contract and non-contract farmers collected between 2007 and 2009. The empirical analysis focuses first on the contracting stage, where firms and farmers match up to contract, examining the role mutual perceptions of risks and a firm's considerations of geographies in determining contract participation. The study then assesses the welfare gains from participating in contracting, suggesting that there is considerable variation in outcomes, both across schemes and

farmers within a scheme, providing the ingredients for churning in participation, or dynamics in a firm's portfolio of contract farmers over time. The study also looks at enforcement problems in these schemes. In the context of weak public enforcement of contracts through courts, firms typically leverage relationship-based incentives along with price-based incentives to improve contractual compliance. Overall, the empirical analysis suggests that despite many positive welfare implications of contract farming arrangements, several frictional elements in the contracting domain seriously limit the instrumentality of contract farming for poverty alleviation in developing countries.

Biographical Sketch

Sudha Narayanan was born in Madras, India, where she completed her schooling and studied Economics as an undergraduate at the University of Madras. She then obtained M.A. and M.Phil degrees in Economics from the Delhi School of Economics, India. Sudha's research interests straddle agriculture, food and nutrition policy, and human development. She is particularly interested in survey-based research, using microeconometric techniques to understand broader questions of agrarian change and transformation in the context of globalization. Despite her zealous attempts to work in other parts of the world, she ends up, inevitably it seems, working on India.

To

Old Madras

and those who left it too soon.

Acknowledgements

This project represents a long and winding journey, accomplished with the help of so many that it is hard to know where to begin to acknowledge their contributions.

My initial interest in the subject emerged when I was working at the International Food Policy Research Institute in Washington, D.C., in 2001. I shared the hallway with a number of people, Nicholas Minot, Eleni Gebre-Medhin, Chris Delgado, Ashok Gulati, Paul Dorosh and Shahidur Rashid, whose collective insight into agrarian institutions and markets I imbibed readily and has been the foundation on which my research rests.

At Cornell University, I had a remarkable committee to advise me. Some of their contributions are reflected in this work and there are others that I take with me into the future. Special thanks are due to Chris Barrett, who served as Chair. He set exacting standards, pushed me to explore each idea to its logical conclusion and to craft my arguments with a technical sophistication that was often beyond my reach. For the freedom he gave me to wander, to lose my way, for anchoring my effort and for guiding me towards paving my own path, I am profoundly grateful. Conversations with Kaushik Basu, William Lesser and Stefan Klonner marked critical inflection points in my thinking and I was enriched looking for answers to their incisive questions. Each of their interventions has been valuable, whether it was in drawing my attention to the need to link theory with data or in helping me distill lessons from empirical analysis to inform policy. I also wish to thank Garrick Blalock for his inputs and for serving as proxy member at short notice, so willingly. Life at AEM would be unsupportable without Linda Morehouse, who, happily, will now be spared of constant firefighting on my behalf. I thank her for her support through the years.

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I was more a student in the field than in the classroom and learnt a great deal from the cross section of people I met - agribusiness executives, input dealers and farmer groups in India. Sathguru's Vijayaraghavan was instrumental in providing me a foothold in the initial stages. P.Karnan shared his accumulated insights from his immense experience in agribusiness. I owe much to Vivek Srinivasan, who provided the support I needed initially to mount a survey of the scale and complexity I was contemplating. I can't imagine I would have gone very far without his timely help. My fieldwork took place in two phases. For the first, I was based at Bishop Heber College, Tiruchirapally, where I was welcomed as one of their own. In Trichy, S.M.Suriya kumar, V.K.Bhoominathan and Arun Kumar helped identify competent field investigators who plodded on cheerfully in the scorching heat of the summer. The second phase saw me at the Tamil Nadu Agricultural University in Coimbatore. Faculty members including Mahendran Kandasamy, P. Balasubramanian and C.Karthikeyan and others such as R.Subramanian and Jothibasu assisted in establishing contacts across the university and with agribusinesses in Tamil Nadu. M.Chandrasekaran provided incredible help with the logistics of the survey while sharing his own rich observations on contract farming practice in Tamil Nadu over the past decade. Thanks are due to the large number of contacts in agribusinesses in Tamil Nadu and elsewhere, to the farmers who spent their valuable time as respondents and to the diligent field investigators. Owing to confidentiality issues, I am unable to name any of them, but they are central to this project and I am indebted to them for making it a remarkable experience.

This work was possible owing to financial support from multiple sources that include a Junior Research Fellowship from the American Institute of Indian Studies, the AAEA Foundation's Chester McCorkle Jr. Scholarship, Ithaca First Presbyterian Church's International Hunger Project Student Research Award, the Norman E.Borlaug Leadership Enhancement in Agriculture Program (LEAP) Fellowship and a grant from the International Food Policy Research Institute-New Delhi Office. I thank Chris Barrett, John Harriss, Ashok Gulati, Bart Minten, M.Chandrasekaran, Michael Carter and K.Nagaraj for supporting my effort to secure these. During the course of this work, I was

affiliated, in turn, to the Madras Institute of Development Studies (Chennai), the American College (Madurai), the Tamil Nadu Agricultural University (Coimbatore) and the Centre for Development Economics, Delhi School of Economics (Delhi). I thank Padmini Swaminathan, R.Mohan and P. Balasubramanian for making these affiliations possible and allowing me access to valuable institutional resources. The views expressed in this work are however mine and do not reflect those of either the grant making bodies or the institutions to which I was affiliated.

Ithaca was Ithaca because of two wonderful people. Erin and Jason have been fantastic intellectual company and amazing friends. I have also been extremely fortunate to have very many precious friends and mentors within and outside my family. That each of them can now hold forth on contract farming, despite not caring the least bit about it is testimony to the parts they have played. Some of them have been my refuge for more years than I care to count, tolerating my extended disappearances and forgiving me my many quirks. I thank each one of them by naming none.

On the many occasions I froze into inaction during the course of this project, wondering how to get going, I turned to Lewis Carroll for advice: "Begin at the beginning and go on till you come to the end: then stop." It has worked unfailingly.

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Chapter 1

Introduction

1.1 Two Views of Contract Farming

Contract farming - described broadly as an institutional arrangement between farmers and businesses to produce and transact agricultural commodities at predetermined prices and conditions - is not a recent phenomenon. Yet, a recent wave of agricultural industrialization and the emergence of large-scale food retailing in developing countries may be precipitating a renewed shift in favor of contract farming on a scale that is probably unprecedented. Changing tastes of consumers, higher demand for processed foods, and the globalization of agro-industry have, each in their own way, contributed to this redefining of producer-processor relationship in these countries (Reardon et al., 2009; Reardon and Timmer, 2005; Reardon et al., 2003; Ruben et al., 2006; Swinnen, 2007; Timmer, 2009; Birthal et al., 2005).

There is little disagreement today about what contract farming means or indeed, why it emerges in the first place. In stark contrast, there is deep disagreement on whether contract farming is a 'good thing'. At one end of the spectrum, contract farming is seen as a vehicle for smallholders in developing countries to take advantage of opportunities that a globalizing trade system has to offer, notably, in non-traditional high value crops.[1] Against a background of persistent agrarian distress in resource-poor regions, advocates enthuse, perhaps rightly, over the changes such firm-farm linkages could bring. In particular, contract farming could solve a number of pressing problems at once - providing market access, inputs, technology, insurance and even specific entrepreneurial skills (Glover, 1984; Goldsmith, 1985; Morrissy, 1974; Williams and Karen, 1985). It is thus presented as

[1]The term smallholder, like peasant, has no universally accepted definition. It is usually taken to mean farmers who own less than one hectare of cultivable land, who have limited resources and tend to depend on family labor (Narayanan and Gulati, 2002).

a win-win situation, with both farmer and agribusiness standing to prosper (Eaton and Shepherd, 2001). At the opposite end, many claim that it supplants traditional structures of production and exchange in a way that produces more iniquitous power relations, exacerbating social differentiation and even proletarianizing the independent farmer (Glover and Kusterer, 1990; Little and Watts, 1994; Singh, 2002). There are also relevant questions about corporate commitment, or rather the lack of it, to the long term ecological and social consequences of these arrangements.

While the debate is far more varied and textured than is conveyed here, it is illustrative of the schism that prevails with respect to normative aspects of contract farming. It is not entirely coincidental that this divide reflects the preferred points of departures of economists on the one hand, and anthropologists, sociologists, geographers and political scientists on the other. The latter have looked at contract farming systems in the context of larger social, political and economic forces in a post-Fordist global economy and consequently invest the discussion with the idea of a systemic agrarian transformation that 'flexible specialization' engineers. The economists' discussion of contract farming has tended to abstract from the context of a system, let alone the larger socio-political landscape, to a more atomistic and static approach where the farmer is the relevant unit of analysis. This enables the view that as an institutional arrangement, contract farming functions as an effective and efficient risk-sharing mechanism between two agents while solving missing market problems.

Indeed, this divide might be the single most important reason that despite the extraordinarily rich empirical evidence we have inherited on contract farming across disciplines, a coherent canvas has failed to emerge. The debate, if anything, has only gained momentum, as empirical accounts of both 'successes' and 'failures', across a range of welfare metrics, are put forth with equal and impressive regularity.

This rift has important repercussions for policy making, often translating into opposing conceptions of the role of the state. If, on the one hand, contract farming is indeed a good thing, advocates are concerned about how this can be scaled up and replicated to have the broadest reach possible. Some would argue that governments ought to be proactive in providing a legal and institutional framework that supports businesses taking up contract farming. On the other

hand, some believe that the state should disallow it altogether, terming it a kind of 'forced agrarian change'. Recognizing this polarity, still others would assign to the state the enigmatic role of having to neither support nor oppose contract farming (Asokan and Singh, 2003). A middle road suggests that if contract farming entails its own set of problems, policy interventions could be put in place to calibrate its functioning. At the very least, the government ought to act to protect the interests of the farmer by fixing terms of the contract, preventing monopsony and instituting formal dispute resolution mechanisms (Minot, 2008; Singh, 2002).

The issue of policy is critical, since the state can and does exert a strong influence on the instrumentality of contract farming in poverty alleviation (Grosh, 1994; Raynolds et al., 1993). Also, given that most developing country governments are resource-constrained, the optimal way of distributing scarce state resources and capacity over a potentially large number of agricultural interventions demands serious attention. It is hence important to determine clearly how states can fashion the particular exogenous institutional context so as to influence (or not) the outcomes of such schemes.

1.2 Bridging the Divide

1.2.1 Motivation, Objectives and Scope of the Study

My thesis foregrounds this deep disagreement regarding the transformative promise of contract farming. The central premise of this work is that methodological differences, especially across disciplines, have generated a false binary in discussions of contract farming, whereas a more integrated theoretical perspective can reconcile these apparently conflicting positions. In particular, this thesis is motivated by a recognition that the analytical apparatus used to analyze contract farming within the discipline of economics tends to view parts rather than the whole. The story of contract farming in developing countries is one with many intricate sub-plots. Economists have developed some of them with much enthusiasm and some others not at all. Consequently there are significant lacunae which prevent the articulation of a comprehensive theory of contract farming. I focus on three of them.

First, the social aspects of contracting arrangements poses a serious challenge to theoretical analysis.[2] In the absence of effective formal enforcement mechanisms, especially in the context of transition and developing economies, and the essentially incomplete nature of agricultural contracts, firms have had to be inventive in putting these arrangements in place, involving structures of social relations and interlinkages with social institutions to support economic exchange (Aoki and Hayami, 2001; Fafchamps, 2004; Kirsten et al., 2009). Whereas in developed countries, issues such as trust might influence outcomes, and coexist with or complement formal mechanisms of enforcement, in developing countries these are often preconditions (Fafchamps and Minten, 2001). Because they are preconditions, relationship-building becomes an instrument, so that firms might cultivate a relationship alongside establishing contracts. This puts the issue of contract farming firmly within the realm of relational contracts. In fact, a business consultant in India exclaimed to me "We don't do contract farming, we do relationship farming!"[3] So, rather than contract farming being a technical transactional arrangement as development economists tend to believe, it is the representation of a complex, socio-techno-economic relationship. While the literature documents the relational nature of contract farming, it is not apparent that this has informed the theoretical foundations of empirical analysis to the extent it should.

Second, most theoretical work has seemed content using a farmer as the unit of analysis. This enables detailed theoretical development of partial equilibrium aspects such as bargaining between farm and firm, welfare distribution across parties, the idea of interlinkage and so forth. Interpreters of this stream of theory, focusing as they do on contractee benefits, tend to unwittingly extrapolate this to the farm population as a whole.

Yet, it is evident that there is an important general equilibrium dimension. Theoretical work that uses the notion of a representative farmer neglects the fact that heterogeneity among farmers partitions them into those who participate and those who do not or might be systematically excluded, leading to important distributional consequences across the actors in the larger domain. That firms use various selection criteria and screening mechanisms is well known and these

[2]For example, Granovetter (1985) discusses the notion of 'embededness', referring broadly to the idea that economic relations between individuals or firms are located in actual social networks and do not exist in an abstract, idealized market. This is not however the only lens through which the social aspects of farm-firm relationships can be analyzed.

[3]Agribusiness Survey, Hyderabad, Andhra Pradesh, 2007.

exclusionary devices can engender different kinds of distributional impacts in different systems. Even among those who participate the welfare outcomes could vary substantially. Further, a firm's contractual relationship with one farmer could have spillover effects for others in a given region. Thus, like the 'technology treadmill', contract farming might well have partial equilibrium effects that may be 'desirable', while generating system or domain equilibrium effects that are not, or vice versa (Cochrane, 1958).

Last but not least, existing theoretical analysis of contract farming have not ventured to explain historical changes and institutional evolution in contract farming schemes that we see so often at a systemic level. Notably, the question of sustainability of these systems is only marginally addressed, and the evolution of contract terms or the farm-firm relationship, rarely. This is important since, given the same starting point, even in the presence of gains to contracting, the selection process deployed by agribusinesses can engineer very different pathways at a systemic level, leading to very different kinds of agrarian transformation that we see empirically.

It is not as if these aspects remain unrecognized. Empirical accounts of contract farming documents each of these quite well.[4] Yet, the absence of an integrated theoretical perspective has led to difficulties in reconciling the apparent contradictions of empirical evidence across countries.

A goal of this thesis is therefore to develop an analytical framework that can arbitrate and mediate these positions. In particular, in the context of the above critiques, this thesis argues for and attempts to build an analytical apparatus to study contract farming that (1) shifts across geographical scales to capture phenomena both at the farmer level and at the level of a contract farming 'domain', (2) incorporates substantively the heterogeneity of farmer types and farmer experiences with contract farming, and (3) incorporates dynamic elements of contract farming relationships, acknowledging the impact that continuity of these relationships into the future can have on economic decisions in the present.

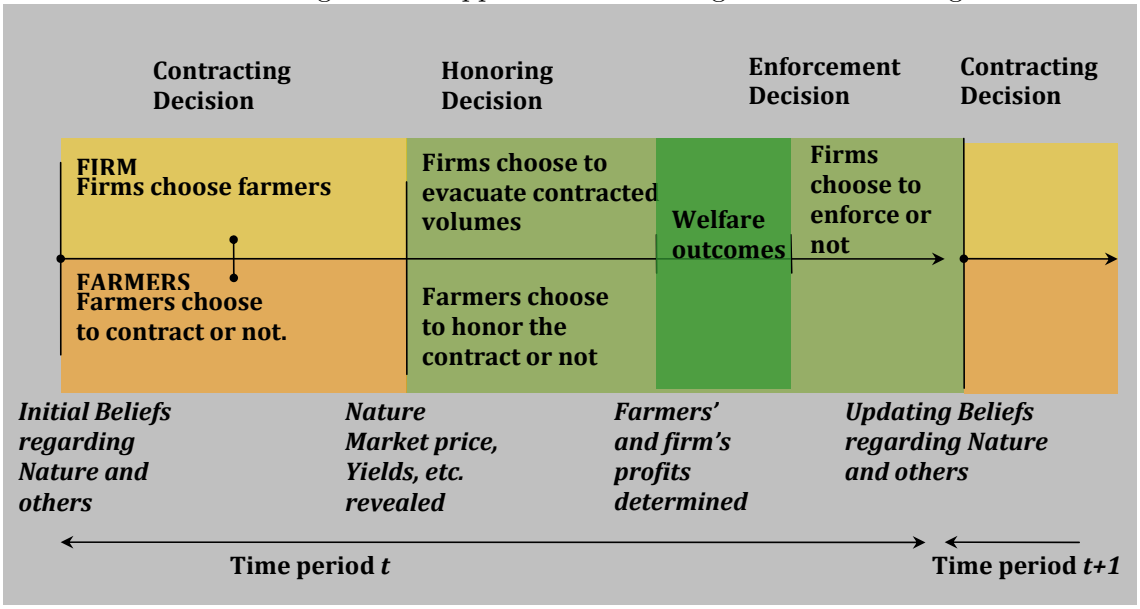
Drawing on insights from modern institutional economics and standard neo-classical tools, I frame the issue of contract farming within Aoki's thesis on Comparative Institutional Analysis (CIA) (Aoki, 2001). Accordingly, contract farming arrangements are institutions defined by a

[4]These are reviewed in Chapter 2.

collection of robust subjective assessments or beliefs agents hold about one another, that have evolved over time through learning, are stable/stationary and are used as a basis for procedurally rational decisions. This thesis suggest that the substantive characteristics of a contract farming scheme represent frictional equilibria over a 'domain' and are systemic, temporal equiilibria. The theoretical effort in this thesis accommodates the Aokian view of institutions by reconstructing the CIA view within a composite neoclassical model of contract farming.

Essentially, the theoretical project involves unpacking a contract farming arrangement into its constituent parts and modeling these separately. Contract farming is then modeled as three distinct component processes that take place sequentially at any given finite time period or interval denoted as t (Figure 1.1). At the beginning of time t, the time of sowing, all agents, farmers and the contract firm make their contracting decisions. The firms decide who to pick as suppliers and farmers make assessments of anticipated welfare gains from contracting over the alternative opportunities available to them before they contract. At this time, farmers hold subjective beliefs about the firm's reliability and firm has its own expectations of how reliable each farmer is likely to be. All agents also hold certain beliefs about market conditions and expected yields for the season. This study assumes that farmers are somewhat myopic so that they factor in only the contracting party's actions within time period t. Following the contracting stage, supplier farmers are matched up with the firm in a temporary equilibrium. Nature then reveals yields and market prices. At the end of the season, after yields and prices have been revealed, comes the stage when the firm and contracting farmers make decisions on whether to honor the contract or not. While honoring the contract, agents are assumed to take into account possible repercussions of their actions (or contractual performance) on opportunities to contract in the subsequent time period, factoring in any cost of the partner's attempt to enforce the terms of the contract. In the context of this study, firms also make a decision on whether to enforce the contract, either through legal channels or by terminating the relationship with the farmer. This option is assumed to be unavailable to the farmer, broadly reflecting the realities of the empirical context of the work. The enforcement decision coincides with the firm's and farmer's profits being determined. This is the welfare outcome that is typically the focus of studies of contract farming. Following the enforcement stage, agents

Figure 1.1: Approach to Modeling Contract Farming



now have a chance to update their subjective beliefs regarding nature and regarding one another's reliability through a learning rule, based on the revealed decisions made at time t with regard to honoring and enforcement. They then move into the subsequent time period carrying these new updated beliefs that now form the basis for contracting decisions in time period $t+1$. This sequence of processes repeats itself, mapping the trajectory of a contract farming system over a domain and across time.

The approach, hitherto, to modeling contractual relationships typically collapses this problem into a one-shot principal agent model. The theoretical model elaborated in this work dismantles this to recover the component processes which are sources of friction and emerge in practice as important arena for action. The theoretical model is thus a composite one, with different component processes fitted into a whole. Notably, this approach explicitly takes into account the entire domain of farmers the firm could potentially contract with and factors in the implications that recurring contractual relationships have for decisions at any given point of time. Such an approach offers an opportunity demonstrate that the apparently conflicting views on normative aspects are not necessarily mutually inconsistent emphasizing the heterogeneity and temporal nature of the contracting experience across farmers.

Given that my effort would be to build an overarching analytical apparatus that can accommodate the range of outcomes that we see in empirical literature, it entails, perhaps inevitably, sacrifice of minimalist elegance for a more cluttered abstraction of reality. However, the potential of such a theory lies in its ability to offer a generic framework for context-specific modeling of contract farming arrangements. This would help understand the diversity of farming experiences across various socio-political and agro-economic contexts and achieve a productive cross-fertilization of perspectives in understanding, even anticipating, the distributional consequences of contract farming. I hope to demonstrate that this lens for viewing contract farming offers the possibility of generating several well-known insights into the practice of contract farming in developing countries.

I then use this framework to examine contract farming arrangements across five commodities in southern India, applying it to answer select empirical questions. The first aspect investigates the twin issues of farmer participation and a firm's selection of contract farmers over a particular contracting 'domain', capturing processes that constitute the contracting stage. The second aspect assesses the welfare implications of contracting in terms of net profits. The third aspect trains attention on the enforcement stage, exploring farmer decisions to honor and a firm's decision to enforce contracts. In dealing with these three aspects, this work departs from most of current literature in seeking to embed the individual agent within the larger domain, capturing different scales of resolution, and in accounting for the recurring nature of contracting relationships. This study makes a conscious effort to draw on information and data from both farmers and firms, weaving together different perspectives in order to validate the theoretical viewpoints. The empirical analysis is based on a combination of qualitative and quantitative data from three sources: a survey of 822 contracting and non-contracting farmers (henceforth, Farmer Survey), interviews with 42 agribusinesses that use contract farming for procurement (henceforth, Agribusiness Survey), and contractual documents from 23 different schemes to create a composite empirical mapping of contract farming practice in India.[5]

While one goal of this thesis is to make the case for a particular theoretical approach to studying

[5]The Farmer Survey initially included 840 farmers, but eighteen were dropped and not used in the analysis due to either incomplete or inconsistent data or due to misidentification or misclassification of farmer type. Details of the survey are presented in the Appendix A.

contract farming, the other goal is to study empirical aspects of contract farming in India, through that theoretical lens, to be able to clarify the normative implications of its practice to illuminate the potential role of the state. This thesis is therefore as much an effort to generate evidence-based policy prescriptions vis-*à*-vis contract farming, as it is an application of the essential logic of a CIA view of contract farming.

1.2.2 Plan of the Study

The thesis is organized in two parts. Part 1, comprising chapters 2 through 4, is a theoretical effort to build a unifying analytical apparatus to examine contract farming in developing countries. Chapter 2 reviews empirical literature and current theoretical approaches. Chapter 3 sets up the larger framework of Aokian CIA and motivates the formal model. Chapter 4 formalizes the notion of contract farming as frictional equilibria, with the particular objective of establishing a framework for empirical analysis.

Part 2 assesses, empirically, select components of the theoretical framework. Chapter 5 provides a backdrop on contract farming in India, with a descriptive analysis of the institutional environment of agribusiness in India. It also draws attention to the appropriateness of India as a site for study. Chapter 6 introduces the study area in the southern Indian state of Tamil Nadu, outlining the five contract farming schemes that form the basis of empirical work. Chapters 7 through 11 zoom in to investigate various parts of the the framework suggested in Figure 1.1 as distinct but related aspects of contract farming in India. Chapter 7 examines farmers' perceptions of the risks and benefits associated with contracting over other alternatives, while Chapter 8 investigates the a firm's selection of farmers over a domain. Chapter 9 assesses welfare outcomes from participation in contracting arrangements. Chapter 10 focuses on the problem of enforcement and the role of social relations in implementing and maintaining contractual relations. Chapter 11 maps dynamic elements in these schemes, identifying the ingredients of institutional evolution. Chapter 12 summarizes the results of the thesis, theoretical and empirical, concluding with a discussion of implications for contract farming policy in India.

Part I
A Theoretical Framework for Contract Farming

Chapter 2

Literature Review

Contract farming has been a focus of academic interest for several decades. The result is a large body of empirical work straddling disciplines and ideological perspectives, exploring different aspects of schemes across geographical regions. This has occasioned periodic reviews of literature, typically with a dual focus. On the one hand, these reviews are motivated by the need to draw lessons from or assess the 'success' of existing contract farming schemes. On the other hand, these reviews address contract farming from a methodological or epistemological perspective in an effort to identify an appropriate analytical lens to evaluate the outcomes of such arrangements. Often, these objectives mingle, so that it is difficult to separate works that are exclusively 'theoretical' from those that are empirical. These reviews have contributed to a deep understanding of the issue. At the same time, they represent an ongoing struggle to uncover the underlying drivers that determine and anticipate the exact nature and consequences of particular contract farming arrangements.

A comprehensive review of works on contract farming, copious as it is, would be a daunting challenge and given the purpose of this study, might not be particularly useful.[1] Instead, this chapter reviews literature on contract farming to identify the interstices between theoretical and empirical perspectives in order to justify the central preoccupations of this study. In particular, this review lays out empirical work to (1) highlight the heterogeneity in contract farming practice or the static diversity of schemes, (2) assess the extent to which studies track dynamic diversity or the life-cycle of a contract farming arrangement, and (3) document the impacts of contract farming at different scales of resolution, at the level of the farmer and the larger 'domain'. The review also pays particular attention to social aspects of contract farming practice, as documented by empirical studies. While reviewing the empirical literature on contract farming, this chapter also attempts a

[1] Extensive reviews of contract farming schemes are available in Bijman (2008); Eaton and Shepherd (2001); Key and Runsten (1999); Minot (2008, 1986); de Treville (1986), to name a few.

critical analysis of the ability of extant methodological frameworks to accommodate these empirical realities. Thus, while a goal is to map what we already know about aspects of contract farming as it prevails, another goal is to revisit the analytical foundations that frame these works.

Following definitions put forth by earlier writers,[2] contract farming can be defined as an agreement, oral or written, between farmer or farmer groups and processing and/or marketing firms, commercial or otherwise, for the production and supply of agricultural products under pre-specified conditions, frequently at predetermined prices. The arrangement could also also involve the purchaser providing a degree of production support through, for example, the supply of inputs and the provision of technical advice. The basis of such arrangements is thus a commitment on the part of the farmer to provide a specific commodity in quantities and at quality standards determined by the purchaser and a commitment on the part of the company to support the farmer's production and to purchase the commodity.

Like Minot (1986), this review focuses predominantly, but not exclusively, on commercial undertakings that take up contract farming and is confined to schemes in developing countries.[3] This review is organized in three parts, the first maps empirical work and the second, methodological frameworks. The third part is a broad articulation of the proposed framework that meshes aspects of current theoretical perspectives, laying the foundation for the theoretical effort Chapters 3 and 4.

2.1 Mapping Empirical Work: The Canvas and the Detail

The most telling feature of contract farming schemes is its polymorphism. Several typologies have been developed to categorize them and to organize their diversity.

One classification is based on the extent of control over processes, due to Mighell and Jones (1963) and propagated by Minot (1986). This is presently the most popular way of thinking about contract farming. Accordingly, *market provision contracts* refer to those where the grower and

[2]I draw on definitions proposed by Dorward (2001); Eaton and Shepherd (2001); Glover and Kusterer (1990); Mighell and Jones (1963); Roy Ewell (1972); Simmons (2005).

[3]There is a rich active literature on contract farming in developed countries, for example, hog, poultry in the United States and dairy and horticulture in Europe. This is left out of the purview, not because they are any less complex or interesting but because contract farming, in these contexts, is not foisted with the role of furthering rural development and poverty alleviation.

buyer agree to terms and conditions for the future sale and purchase of a crop or livestock product. *Resource provision contracts* are market provision contracts that have, in addition, commitments by the buyer to supply selected inputs, including, sometimes, advice on land preparation and technology. The third category with the maximum intensity of control is the *management specification contracts*, with the grower agreeing to follow recommended production methods, input regimes, and cultivation and harvesting specifications.

Another classification makes distinctions on the basis of actors (private sector firms, public sector firms and parastatals, international aid agencies), presumably on account of their different motivations. These are outgrower schemes (private players), satellite schemes and nucleus estate-outgrower schemes. *Outgrower schemes* provide production and marketing services to farmers on their own lands.[4] *Nucleus Estate-Outgrower Schemes* are those where a core estate and factory is established by the firm and farmers in the surrounding area grow crops on part of their own land, which they sell to the factory for processing. *Multipartite Arrangements* is a term used to emphasize the participation of several actors, each being responsible for a particular aspect of the contracting arrangement (Ellman, 1986; Glover and Kusterer, 1990).

These categories were incorporated into a more detailed scheme by Eaton and Shepherd (2001), who then propose a five-fold classification: (1) Centralized model, (2) Nucleus estate model, (3) Multipartite model, (4) Informal model, and (5) Intermediary model. The *centralized model* involves a centralized processor and/or packer buying from a large number of small farmers, often used for tree crops, annual crops, poultry and dairy. Products often require a high degree of processing, such as tea or vegetables for canning or freezing. Vertical coordination is through quota allocation and tight quality control and the sponsors involvement in production varies from minimal input provision to the opposite extreme, where the sponsor takes control of most production aspects. The *nucleus estate model* is a variation of the centralized model, where the sponsor also manages a central estate or plantation. The central estate is usually used to guarantee throughput for the processing plant but is sometimes used only for research or breeding purposes. It is often

[4]For Glover and Kusterer (1990), however, these generally connote a government scheme with a public enterprise, purchasing crops from farmers, either on its own or as a joint venture with a private firm, or private firms operating exclusively.

used with resettlement or transmigration schemes and involves a significant provision of material and managerial inputs. The *multipartite model* may involve a variety of organizations, frequently including statutory bodies. These can develop from the centralized or nucleus estate models, for example, through the organization of farmers into cooperatives or the involvement of a financial institution. The *informal model* is characterized by individual entrepreneurs or small companies and involves the informal production contracts, usually on a seasonal basis and often requires government support services such as research and extension and involves greater risk of extra-contractual marketing. The *intermediary model* involves a sponsoring form that subcontracts linkages with farmers to intermediaries. Consequently, there is a danger that the sponsor loses control of production. It turns out that these are often overlapping categories and schemes could combine aspects of these different types.

The number of such characterizations and approaches for typologizing contract farming arrangements illustrates the challenge of organizing diversity in meaningful ways. Despite shared features that define these organizing principles, there could be significant differences both in what constitutes the 'terms of the contract' (like price, quantity and so on) and in the exact nature of arrangements. There could be differentiated contracts (different contracts for different growers) or uniform contracts, where all contractees accept the same parameters, for example, the contract price.[5] Contracts could be oral or written. Both are prevalent in developing countries. The contractual price itself could be fixed or formulaic. For instance, in the case of the latter, it could be linked to a reference market price, e.g., a mark-up on it, or a moving average or to technical norms of cost of production and so forth.[6] Different pricing arrangements have different implications for which of the contracting parties bears a greater part of the price risk. In terms of the quantities too, quotas could be rigid, but this could also be notional. In the latter, there could be a minimum that the farmer has to commit to. In a few cases, there is no commitment at all so that farmers are actually free to sell elsewhere, if they choose.

[5]Differentiated contracts were used, for instance, by Campbells in Mexico; they were later pressured by other firms in the region to give it up (Key and Runsten, 1999). Theoretically, this can be seen as separating or pooling equilibria in a principal agent framework or could be characterized as a collection of bilateral bargaining islands where transactions take place.

[6]A wide variety was observed and documented in the 1970s by Kirsch (cited in Glover and Kusterer (1990)).

As far as operationalization of contracts is concerned, contracts could be with individuals or with groups, sometime with the male head in the household, and in rarer cases, with a woman within the household. They could be 'take it or leave it' contracts or actors could bargain bilaterally over it. In general, when there are a large number of farmers willing to contract, firms have the luxury of selection, which is then based on a pool of farmers identified (by the firm) or self-identified. These could be done formally by the firm's employees, appointed agents or by informal intermediaries such as village leader, progressive farmer, former trader-middleman, and so on. Where smaller number of farmers are involved there could be some bargaining over contract terms. Often contracts are rationed, especially with group contracts, with no more than one contracting group per village.

There are other techno-economic aspects across which contracts differ. For instance, the duration of the contract varies a great deal. It might involve a long lock-in period, even ten years, especially for tree crops and other perennial crops or this could be as short as a single season for field crops. Contracting could be volumetric or in terms of acreage. In other words, contracts can imply farmers committing to a particular quantity to be exchanged or it could involve the farmer committing to a certain acreage for sowing the contract crop. In the former, the farmer is more likely to bear yield risk, whereas in the latter, it is the firm that assumes yield risk. Further, the contract could be with people already growing the required crop, while in others, it could involve introducing a new crop, so that contract farming embodies, implicitly, a new technology and effects a new cropping pattern. The nature of crops varies as well; some are highly perishable, high value (like horticulture, sugarcane and so on) whereas others are low value storables like staples. These contract crops could be processed further or sold with minimal value addition, like packaging and grading. The destination for these could be export markets, which would entail, typically, stringent quality and health standards, or for the local market. In developing countries, the latter would make fewer demands on quality and traceability, although this may be changing with the coming of big food retailers. Arrangements can be multi-party or solo efforts, and these could be propped up with implicit and explicit state subsidy or with no support at all.

While it is suggested that each of these elements influences the nature of vertical coordination arrangements and their welfare outcomes (variously defined), it is useful to think of these elements,

a subset of them at least, as themselves being determined simultaneously. Depending on the particular goals of the firm involved and the exogenous context, various aspects of the contracting arrangement share a complex endogeneity so that they are jointly determined.[7]

Clearly, contract farming arrangements manifest in a bewildering variety of combinations. In fact, it has been pointed out that, as an analytical category, perhaps the only thing that binds all contract schemes together is the contract (Baumann, 2000).

Yet, even the notion of a contract is contested. It is well recognized in empirical work, that not only are contracts complex and incomplete, as agricultural contracts usually are, but they are often implicit and relational.[8] Often the contract is a very broad representation of the relationship, where agreements on particular aspects are no more than notional. Relatedly, alongside the technical fixity of the contract, there is a fluid 'moral economy' of the contract (Clapp, 1994; Scott, 1976; **?**), where the farm-firm relationship plays itself out. These make it hard to define precisely the very nature of contract.

Given this diversity in contractual form, it is only expected that the consequences are similarly wide-ranging. These differ across a host of particular aspects, such as power relations within the household, labor market, efficiency, technology adoption, diversification, environmental impacts, integration into a supply chain, social differentiation, farmer groups and horizontal coordination and so on.

For the particular purpose of this thesis, I organize select empirical work on contract farming across two dimensions: first, across partial (questions of the individual farmer) and domain level effects (questions of agrarian society) and second, based on static (short term, synchronic) and

[7]While taxonomies help organize diversity of contract farming schemes, they are often inadequate tools to explain and predict the nature of arrangements especially when the organizing principles themselves are endogenously determined. For instance, too often, the intensity of the relationship between farmer and sponsor is used to typologize contract farming schemes. Yet, it is possible that the intensity of the relationship itself is a function of the contract commodity and the broader agro-economic or social context.

[8]Contracts are incomplete when arrangements cannot be made for all possible contingencies. A relational contract is described in different ways. It is a contract that specifies only the general terms and objectives of a relationship and specifies mechanisms for decision making and dispute resolution(Milgrom and Roberts, 1992). Another description considers a relational contract to be one that do(es) not try to take account of all future contingencies but are nevertheless long-term arrangements in which past, present and expected future personal relations among the contractual parties matter (Furubotn and Richter, 2005). A third common characterization of relational contracts is simply as (i)nformal agreements and unwritten codes of conduct that powerfully affect the behavior of individuals (Baker et al., 2002).

dynamic (long term/evolutionary, diachronic) ramifications of a contract farming system over an observed time period (Table 2.1). The social aspects of these arrangements appears as a leitmotif.

I focus on a subset of questions that have been addressed at different levels. Perhaps the most pressing questions today, from the point of view of economists are (1) whether contract farmers do better in terms of income and efficiency than farmers who do not contract and (2) whether contract farming systems are biased against certain categories of farmers. Recent reviews of these issues include Minot (2008); Reardon et al. (2009); Reardon and Timmer (2005); Swinnen and Vandeplas (2007); Ruben et al. (2006).

Table 2.1: Scheme for Literature Review

	Partial Effect	**General Effect**
Static or Synchronic Diversity	Does a particular farmer contract? Why? Nature of contract and contractual relations? What is the effect on income? What are the implications for efficiency?	Portfolio of farmers: Which groups are included and which ones are not? Geographic poverty traps: Are some regions systematically excluded?
Dynamic or Diachronic Diversity	Does the farmer cease to contract? How do the terms of contract change? Are income gains sustained over time? (e.g., agribusiness normalization, indebtedness, peasant capitalist) Are these efficiency implications long term? (e.g., environmental degradation)	Does the contract farming scheme survive? Impact on agrarian transformation, social stratification, etc.

The general findings on the question of income suggests that contracting farmers do earn higher incomes. Minot (1986) offers one of the earliest systematic reviews of contract farming schemes and finds that most studies report higher income of participants. Little (1994) concludes that incomes from contract farming increased for a moderate (30-40 percent) to a high (50-60 percent) proportion of participants. In a review of Africa's experience with contract farming in the early 1990s, Porter and Phillips-Howard (1997) conclude that farmers were generally better off as a result of their participation in contract farming. Later studies suggest that when farmers participate in

modern food industry channels, compared to those only in the traditional channels, have higher net earnings per hectare or per kilogram marketed (Gulati et al., 2008; Reardon et al., 2009; Singh, 2007).[9]

In general, the selection of farmers into contract schemes could be associated with the same underlying attributes that put some farmers on a higher level of welfare. If this were the case, the impact of contract farming on welfare outcomes of participating farmers would be overestimated. More recent studies typically correct for the possibility that certain unobservable characteristics that are associated with participation. While the results seem to suggest that contract participation tends to increase incomes (Bellemare, 2010), in some cases, the effects were reported to be ambiguous (Escobal et al., 2000).

Apart from direct pecuniary benefits in terms of income, there is some evidence of reduction of price risk for the farmers, although only a few studies document this with any rigor. Knoeber and Thurman (1995) find that close to 97% of the price risk in broilers faced by the farmer is transferred to the firm. Ramaswami et al. (2005) find a similar situation in the case of broiler contract farmers in southern India, as does Michelson (2010) for suppliers to Walmart in Nicaragua. Bellemare (2010) reports that the volatility of the total income of the average household fell by 16 percent, implying that that participation in contract farming has indirect expected utility impacts on household welfare. Benefits could also be in terms of reduced market risk of transaction due to implicit or explicit contracting via informal prefereed supplier relationships (as Hernandez et al. (2007)show in Guatemala) or as simply better access to quality inputs (Minten et al., 2009).

Such findings extend to efficiency as well. A number of recent studies find positive overall impacts of contract farming on productivity or efficiency. In a study covering livestock farms in the Philippines, India, Thailand, and Brazil, Delgado et al. (2008) found evidence that contract farming tends to improve the relative profit efficiency of small farmers. Key and McBride (2001) found evidence that hog farming under contracts in the United States tends to have higher factor productivity than independent hog farmers. In a study on poultry production in India,Ramaswami

[9]These are just few examples and is by no means a complete review.

et al. (2005) found evidence that contract farming helped reduce farmers' production costs through improved technology and management practices as did Kumar (2007) for tomatoes in India.

While contract farmers do record impressive benefits in terms of income and access to technology, studies suggest that often alongside these benefits, there may be significant problems as well. Even if small farmers participated, they were invariably caught in a weak bargaining position vis-*à*-vis the firm; economists engaged in micro studies rarely focus on the texture of the relationship. Other social scientists emphasize that what matters is not whether or not a farmer is included, but the manner in which they are included and the exact nature of the farmer-firm relationship. Often these discontents coexist with farmer satisfaction over the contracting arrangement (as reported by Singh (2001, 2000), for instance, in contract vegetable production in Punjab state in India). Several studies identify problems such as asymmetric power between farmers and companies, violation of the terms of the agreements (Porter and Phillips-Howard, 1997; Singh, 2001), and so on. The real question, according to some, is with regard to the contract farmer's power of bargaining (Swinnen, 2007). Little and Watts (1994) compile a set of seven case studies of contract farming in sub-Saharan Africa, focusing on conflicts between farmers and the contracting firms and the imbalance of power between the two parties, again, despite rising incomes (Brannstrom, 2000; Collins, 1993). Gender inequities and intra-household tensions over the allocation of new revenues frequently emerge as a problem (Carney, 1988; Collins, 1993; Dolan, 2005; Dolan et al., 2002; Watts, 1994a). Similarly, the loss of autonomy and independence for the growers who enter into contracts, is significant. This is frequently deemed to be a chief problem in the transnational capitalist transformation of agriculture. (Clapp, 1994; Collins, 1993; Gwynne, 1999; Watts, 1994b; Key, 2005; Watts, 1994a)

While the benefits (or costs) to contracting is essentially a partial effect, the question of who is included and who is not is a domain level or systemic phenomenon.

Farmer selection is important for obvious reasons. If contract farmers indeed do better, it is contingent on their being 'selected' into systems in the first place. Therefore, if contract farming is advocated as a way to involve small farmers in markets, they would need to be inclusive. This aspect has now come to be called social performance (Warning and Key, 2002), indicating a certain notion of 'equity' in selection.

Evidence on inclusion is equivocal at best. In general, while there is evidence that small farmers are particularly challenged to meet the volume, cost, quality, and consistency requirements of downstream players, increasingly dominated by supermarket chains and large -scale agro-processors this does not necessarily mean that there is widespread exclusion and thus upstream consolidation in the food system. (Reardon et al., 2009; Reardon and Timmer, 2005)

A number of studies show that small farmers do indeed participate in these schemes. Some suggest they they participate overwhelmingly in these schemes. There are also examples of firms contracting *exclusively* with smallholders (Glover and Kusterer, 1990; Von Braun et al., 1989; Wang et al., 2009). In several other schemes, however, larger farms (Dileep et al., 2002; Kumar, 2007; Carter and Mesbah, 1993) seem the likely participants in contract farming arrangements. This is often despite the high labor intensity of contract crops, where small farmers might be able to draw on family unpaid labor.

As far as contracting for large-scale retail markets is concerned, some studies find that retailers tend to source from large-scale processors in order to reduce transaction costs, because those processors possess adequate logistics and transportation capacity and are able to meet the private standards of the retailer. Small farmers who do not have the capital to meet the requirements of retailers tend to be excluded, as illustrated in studies of potatoes in Ecuador (Zamora, 2004) and vegetable producers in Thailand (Boselie et al., 2003). Neven et al. (2009) find that a threshold capital vector for entrance in the supermarket channel hinders small, rainfed farms in Kenya. Most of the growers participating as direct suppliers to that channel are a new group of medium-sized, fast-growing commercial farms managed by well-educated farmers. In such cases, it is not clear if contract farming does solve missing market problems for large farmers or whether these firms may be leveraging 'an advantage' and replacing existing institutions.

In still others, firms contract simultaneously with both large and small landholders (Bivings and Runsten, 1992)). In general, it has been observed that smallholders are included when there is a homogeneous landholding pattern involving predominantly smallholders (e.g, **?** in Senegal). In a similar vein, more recent studies point out that when there is scale dualism,(Berdegue et al., 2005, 2007; Henson and Reardon, 2005) for Mexico show that leading supermarket chains source

mainly from large-growers when they face a sector that is scale dual and from small farmers when they face a sector dominated by small farmers. Stated another way, wealth or land-size, defined variously, do not seem to be the factor distinguishing contract farmers from non-contract farmers (Miyata et al., 2009; Ramaswami et al., 2005; Warning and Key, 2002).

While the debate on small farmer inclusion persists, it has been observed by many that land size may not be a key driving factor at all. Often, younger, less experienced farmers get selected into these systems, as do farmers who may have non-land assets or even specific skills or attributes such as commitment to quality (Runsten and Key, 1996a,b). The ability to make fixed investments (Berdegue et al., 2005, 2007, 2006), quality certification, irrigation and access to roads is important (Hernandez et al., 2007; Miyata et al., 2009; Stringer et al., 2009). Further, the actual process of farmer selection is usually intertwined with social relations. Sometimes a lead farmer or village head is asked to identify potential contractees, sometimes, middlemen (on occasions, former traders). There are instances too of the firm asking villagers chose on the basis of reputation of the potential contractee amongst the villagers (Dev and Rao, 2005; Glover and Ghee Lim, 1992; Miyata et al., 2009; Warning and Key, 2002; Aoki and Hayami, 2001). This underscores the importance of issues such as social networks, reputation, trust and perhaps even ethnicity in the selection process, rather than the size of landholding.

Interestingly, there is no fixity in who is selected. Over time, those farmers who were contracting may be dropped and others, who were not, included. Runsten and Key (1996b) find that multinational tomato processors in Mexico first contracted with large growers but then eventually involved also the small growers because side-selling was a problem with their larger growers. An exporter in Thailand that started producing its own horticultural products on company land and later shifted to smallholder contract production (World Bank, 2006). Herath and Weersink (2009) note that the Sri Lankan tea sector has changed from one dominated by vertically integrated plantations to one where processors source from from small, independent growers. Minot and Ngigi (2004) describe the evolution of several contract farming schemes in Kenya, including one (Del Monte pineapple) that gave up on contract production and others than have shifted from large scale to small scale production.

The reverse, i.e., movement from small to large-scale suppliers could happen as well. For example, the Xiaobaiyang chain in Beijing is known to have shifted from 1000 to 300 processed food suppliers in two years as it centralized its procurement system (Hu et al., 2004). Dolan et al. (1999) observe consolidation in the export sector in Kenya with a sharp reduction in sourcing from small farmers. In the case of processing, Farina et al. (2005) find a similar trend among dairies in Argentina and Brazil. Similarly, leading Russian chains focus only on a handful of foreign and domestic suppliers for dairy products (Dries and Reardon, 2005). In Senegal, green bean exporters switched from small-scale contract production to large-scale production (Swinnen and Maertens, 2008).

While selection into contract farming systems is important, there are other general domain level or systemic effects as well. Reardon and Timmer (2005) observe that in the context of food retailing, actors in the traditional food industry often make investments in procurement and retailing aimed at improving quality and efficiency to keep up with organized food industry. This spillover or ripple effect could generate gains for the economy as a whole.

There is also an effect on employment. Often, when smallholders are excluded, they may nevertheless have employment opportunities on contract farms and outside through ancillary or related activities. For example, the impact of the Chilean fruit boom (Jarvis and Vera-Toscano, 2004), or the growth of vegetable export zones in Guatemala (Von Braun et al., 1989) and in Senegal (Maertens and Swinnen, 2009). Large-scale contract farmers often hire in seasonal laborers, who are themselves smallholders (Runsten and Key, 1996a). In fact, Key and Runsten (1999) show that contract farming can have important multiplier effects on employment, infrastructure and the development of local markets in Latin America. Neven et al. (2009) documents positive employment effects generated by supermarket suppliers in Kenya. However, these authors emphasize that the impact of such labor arrangements on rural development depends mainly on the type of grower that is involved. Singh (2001) points out that in the case of India, most of those employed on contract farms were paid below legal minimum wages and worked in poor conditions. A majority of them were women and children. In the context of the tomato agro-industry in Mexico, Barron and Rello

(2000) point out similarly difficult circumstances for these farmer-laborers, as does Selwyn (2007) in the case of sugar contracts in Brazil.

Clearly, this has the effect in the longer run of stratifying agrarian societies and possibly exacerbating economic inequalities if it puts the two groups on different income growth trajectories (Key and Runsten, 1999; Korovkin, 1992). Little and Watts (1994) point out increasing rural inequality in their studies as contract farmers grow wealthy enough to hire farm laborers. Social differentiation too can emerge across the domain. For instance, Raynolds (2002, 2000) discusses studies that point to the modification of class relations among agents who intervene at different points in the commodity chain, where contract farming has resulted in new forms of control over agricultural production by food processing companies, banks and supermarkets.

Only a few studies have tracked contract farming systems over time. Korovkin (1992) and Vellema (2009) are interesting exceptions. The paucity of studies on evolution of systems is especially unfortunate, since these qualitative studies often produce a different hue to the findings of static and partial equilibrium studies. For instance, firms might often be able to squeeze farmer margins over time if farmers have limited alternatives. Within a region, firms' repeated selection of a subset of farmers accentuates or aggravates social differentiation in the long run.

In fact, anecdotal accounts suggest that dynamic of contract farming arrangements is probably far more critical than we currently recognize, particularly with respect to social stratification. Korovkin (1992) observes that contract farming contributes to the 'differentiation and disintegration of the peasantry', offering rich peasants opportunity to incorporate modern technologies, augment assets and increase their reliance on wage labor, while at the same time accelerating the transformation of poor peasants into a 'rural semi-sub proletariat'. (Korovkin, 1992). This has been documented by others such as Collins (1993); Gwynne (1999); Storey and Murray (2001); Watts (1994b). Some have noted increased concentration of land ownership (Gwynne, 2003) in the region. Sometimes, the poor sell their land, while the going is good ,i.e., when they get employed as farmhands on contract farms. This puts them in vulnerable positions vis-a-vis exogenous shocks that destabilize these schemes (Korovkin, 1992), and these 'new labor' choose to migrate to the cities.

Studies also suggest that when food retailers in developed countries switch suppliers, it is often without warning, and this could have sudden but costly impacts through destabilizing contract farming arrangements (Dolan and Humphrey, 2000; Mannon, 2005). Fold and Gough (2008) study how changing consumer preferences in the European Union affected contract pineapple production in Ghana. More recent work discusses similar issues wherein a constraint from the demand dislodges the supply chain arrangements upstream at the farm level (Ashraf et al., 2009; Mehta and Nambiar, 2007; Mehta et al., 2002). Ashraf et al. (2009) point out in the case of DrumNet, that the services provided increased production of export crops and lowered marketing costs, leading to a 32% income gain for new adopters. The services however collapsed one year later when the exporter stopped buying from DrumNet because farmers could not meet new EU production requirements. Farmers sold to other middlemen and defaulted on their loans from DrumNet. Such experiences may explain why farmers are less likely to adopt export crops. Mehta et al. (2002) discusses the collapse of layer contracting in India following the European Union ban on eggs on account of Sanitary and Phyto-sanitary issues.

Even for those who are included, erosion of alternatives (other institutions) undermines their position by creating dependency, and therefore vulnerability over time. It is also often the case, that initially, firms set attractive terms to start off with, to get farmers into the fold, and then subsequently tighten them - a practice called 'agribusiness normalization' (Glover and Ghee Lim, 1992; Glover and Kusterer, 1990). Also, when external market conditions become unfavorable for firms, they may alter their relations with producers by imposing higher quality standards and enforcing tougher contracts. This was seen at the end of the 1980s in the case of small-scale fruit production in Chile, for example. The tough conditions written into some of the contract clauses forced some producers to sell their land to the fruit-exporting firms because of high levels of indebtedness (Gwynne, 1999).

In other cases, there have been documented instances of inappropriate technology recommended to farmers by the firms (Rehber, 2004) that entailed either crop loss or deterioration in soil and environmental conditions over time. In Costa Rica, for example, contracting resulted in farmers using their land more intensively, with higher use of agrochemicals and water exhaustion. All these

environmental costs were borne by the farmers in the long-run (Pomareda, 2006). This is especially true if the firm is not tied locationally to an area (via say, a processing unit or factory), making it easy to shift to another region to source produce.

Importantly, the survival of a contract farming scheme cannot be taken for granted. As Minot (1986) points out, failure rates of contract farming are high, but failures are rarely documented. In many cases, contract farming is abandoned altogether, often with dramatic suddenness.

Studies suggest that contextual issues play a large role in the sustainability of systems. A classic 'macro-example' is that of Thailand, where the failure was systemic (Glover and Ghee Lim, 1992). With Thailand's economic growth in the 1980s, options for farmers became more diverse; several took to investing in real estate and left contract farming. As (Glover and Ghee Lim, 1992) point out, contract farming became the victim of Thailand's economic success. They emphasize that its passing, if it comes about in such ways, should not necessarily be resisted.

The evolution of commodity market structure could also be significant. It has been suggested that for survival of contract farming, an 'essential pre-condition' is 'quasi-monopsony' (Sivaramkrishna and Jyotishi, 2008). Others have observed that price commodity fluctuations tend to put grower-firm relations under great strain (Glover and Ghee Lim, 1992; Gulati et al., 2008). It is now apparent that where there is competition in contracting so that there is no monopsony for the farmer, it may be hard for firms to maintain contracting relationships unless the firms collude (Swinnen, 2007).

Sustainability of a contract farming scheme is also predicated on contract enforcement that reduces uncertainty. In that sense, it also reflects sustainability of a relationship and therefore of continued trust and so forth. Swinnen (2007) review studies of contract farming schemes that relied on private enforcement, as do Gow et al. (2000) and Ruben et al. (2006).

None of these problems is ever likely to emerge from snapshot studies. Actors in the particular domain might not even be able to anticipate these dynamic changes. From the point of view of policy making, it is important to have information on the dynamic outcomes, to stave off potential catastrophic risks for intended beneficiaries.

2.2 Contract Farming as Theoretical Subject

It is evident that empirical literature emphasizes time and again that contract farming schemes are incredibly diverse, often representing intricately interlocked relationships between agents. Not only are contracts themselves polymorphic, the broader practice of contract farming varies both over time and place. Further, this is true both in terms of partial effects (impact on an individual agent) and general effects (impact over the entire domain). This complexity poses particular methodological challenges.

The diversity of contract farming arrangements has sometimes led to a general skepticism of universalistic models. It is believed, for instance that the "heterogeneity of contract production - a diversity embracing crops, actors, production relations and institutional links - strongly suggest that any effort to outline a general "theory" of contracting would be foolhardy and ultimately unproductive" (Watts, 1994b, page 5). Yet, at the same time, in a conversation, an economist asked: have we not modeled this (contract farming) already?[10] This suggests, in contrast, that there is an essential unchanging 'sameness' that can be and in fact has been explained within existing paradigms.

This disagreement itself makes it important to ask how far existing methodological frameworks to examine contract farming have succeeded in addressing these aspects, and whether they have sought to do this at all.

2.2.1 An Overview

Theoretical efforts at explaining contract farming as a governance structure is currently dominated, overwhelmingly, by neoinstitutionalism or New Institutional Economics, especially the transactions cost approach Williamson (1975).[11]

Within this framework, contract farming is seen to emerge as the optimal choice from options ranging from spot-market transactions to complete vertical integration. The appropriateness of

[10] July 10, 2006. Personal communication.

[11] I focus on the most common frameworks used currently. The SCP (Structure Conduct Performance) approach, the French Institutional school, the *filière approach*, etc. have also been used at different points of time to discuss contract farming. I do not dwell on these here.

transactions cost approach to explaining agricultural transactions has been discussed widely (Grosh (1994); Jaffee (1987); Key and Runsten (1999); Masten (2000); Minot (1986); Warning et al. (2002); Allen and Lueck (2003) and many others). According to this view, the economic world is characterized by *frequency of transactions, bounded rationality and asset specificity* in a context of uncertainty and opportunistic behavior. The greater the intensity of each of these, the more likely a firm is to vertically integrate.

Allied to the transactions cost approach, is the so-called *property rights approach*, that suggests that the owner of a nonhuman asset possesses residual control rights over that asset and that there is an optimal allocation of these rights (Grossman and Hart, 1983; Hart and Moore, 1990). Here, the firm is seen to emerge to allocate residual rights of control over property, and it could well be the case that this optimal allocation is such that not all activities take place within the firm. Reimer (2006) develops such a model to explain vertical integration of the pork industry in the United States, allowing for bargaining power. Whinston (2003) offers a more general framework for explaining the role of transactions costs in vertical integration within the property rights framework.

The third active stream draws on *New Development Economics* comprising economics of information, agency theory and the traditional tools of neo-classical analysis. Contract farming in this perspective emerges as an institution to address issues of missing markets in an environment of pervasive risks, incomplete markets and information asymmetry. Because it serves to redress the problem of missing markets, it leads to a Pareto improvement, and is hence efficient. Many authors thus see contract farming as an extension of the share contracting problem, with slight modifications so that here the 'agent' owns land and labor and the 'principal' owns perhaps some asset specific investment (like a plant) and capital, inputs and access to markets. Contracting is then, among other things, a way of solving missing market problems and allocating risk between producer and contractor; the former takes the risk of production and the latter the risk of marketing (Baumann, 2000). From this perspective, several scholars have modeled contract farming within the principal-agent framework. Within this, most focus on the terms of contract itself. Knoeber and Thurman (1994), for instance, study broiler contracts that use tournaments and Bogetoft and Olesen (2003); Olesen (2001) are able to explain the existence and welfare consequences of two-

part pricing and differentiated contracts in the Danish pea industry, as an outcome of the need to balance risks and incentives.

Some scholars situate the discussion of vertical coordination in the larger context of market structure and industrial organization theory. Royer and Rogers (1998) and Holloway (1998) analyze contract terms and vertical integration in the context of different market structures. Knoeber and Thurman (1994, 1995) and Goodhue et al. (2000) suggest a core motivation for broiler industry integration is sharing of input and output price risk and production risk. Hennessy (1996) attributes vertical integration in the food industry generally to information asymmetry regarding product quality. Hueth et al. (1999), Levy and Vukina (2004) and others suggest similar motivations for integration of the pork industry.

Some others, while ascribing to the transactions costs explanation for the emergence of contract farming, have focused on the distribution of efficiency gains across actors using a bargaining theoretical framework as in Bell and Zussman (1980). Swinnen (2007) use this as a lens to assess the effect of competition on rent distribution, efficiency and equity in firm-farm relations.

Most of these studies acknowledge that contractual incompleteness exposes practices to risks and recognize that in in an environment of non-enforceability of contracts, this could be immensely costly. Additional costs of contracting emerge in the form of failure to adapt, what Williamson (1991) calls 'maladaptation costs', the hold-up problem being an example.[12]

Apart from this, there is a distinct body of works that has sought to retrieve the notion of *social embeddedness* or its inverse in contract farming schemes, using the relational nature of contracts as the fulcrum. Aoki and Hayami (2001)for instance argues for according a preeminent place to community and social relations in economic analysis, just as Fafchamps (2004) proposes analytical frameworks to analyze rural economic relations as social relations. The theoretical work on relational contracts suggesting that relational contracts can achieve stable outcomes that are efficient and mutually beneficial is only just finding its way into empirical work on contract farming (Levin, 2003). Gow et al. (2000),Swinnen (2007), and Kirsten et al. (2009) all underline the centrality of private enforcement of contract mechanisms to stable and sustainable engagement.

[12]See Klein et al. (1978); Grossman and Hart (1986).

2.2.2 An Assessment

It is now recognized widely that the issue of contract farming, complex as it is, straddles all of these sub-fields. While each of these sub-fields have provided a lens to view certain aspects, from the perspective of the key concerns of this work, many of them seem to throw away the baby with the bathwater.

Agricultural economists have focused sharply on identifying organizing principles by which we can understand how these systems work, drawing on a collective of these theoretical perspectives to identify features of the successful schemes that lead to particular outcomes of interest. This *taxonomic approach* has been widely used and has helped integrate a range of theoretical perspectives into empirical work. This approach is exemplified by Key and Runsten (1999); Warning et al. (2002), for instance. Others try and identify conditions under which contract farming 'makes sense' (Eaton and Shepherd, 2001; Minot, 2008; da Silva, 2005; Simmons, 2005).

Despite this, there are significant gaps between what the analytical frameworks can explain or have explained or sought to explain, and those that remain unexplained. While there is a hint of correlates of diversity there is hardly any explanation of its emergence or existence. Similarly, although these approaches mention evolution in contract farming experiences (e.g., case studies of Key and Runsten (1999)) there is rarely an explicit articulation of how or why such changes do, in fact, take place. This is partly because of a taxonomic approach to explain variation, which allows only as many possibilities as the combinations of taxonomic categories would allow. So, the diversity itself is limited, emanating from a set of organizing principles. Sometimes, changes occur over time from within the system as agents learn about each other and not just exogenously. It has been pointed out that as an institutional mechanism, contract farming requires a continuous adjustment process, according to the characteristics of the agents and the exogenous conditions they are facing (Dorward, 2001; Saenz Segura, 2006). Yet, taxonomic frameworks don't go far enough to explain these.

2.3 A Question of Methodology

The complexity and diversity of contract farming experience in developing countries has prompted researchers to question the relevance of generic analysis. Echoing Watts (1994b), Little and Watts (1994) concludes that the "diversity is so great that it is better to focus on the motives and power relationships of the contracting parties than on the generic institution".

Consequently, several authors direct criticism at neoclassical economic analysis, contesting its view of contracting as a purely technical arrangement, something that grossly undermines the diversity that we see in reality. Yet, parallel to this wrestling with diversity, there is recognition of a certain universality of firm-farm arrangements. Indeed, the frequent claim that contract farming is nothing more than a version of the putting out system underscores the generic aspect of such arrangements. Not only is this form common across sectors, it has also been an enduring historical feature of economic organization.[13] Other social scientists too subscribe to a certain contextual universality, placing contracting within a neo-Marxist framework in which social relations of production and control of the labor process become the central defining features.[14]. Thus, contracting is seen as being subsumed within a broader phenomenon of global restructuring of agrarian production relations.

Clearly, irrespective of ideological orientation, there is broad agreement that contract farming in practice manifests, at the same time, both diversity and a certain universality. The question then is perhaps not whether or not we should try to formulate a general theory but rather explore how we can develop such a theory that captures the universal aspects of contract farming as a phenomenon without negating its essential complexity or diversity. Also, (how) can this theory account for dynamics over time while including both partial and general effects? To the extent that such a theory accommodates this diversity and does not privilege universality over differences, it

[13]For interesting parallels between modern day contract farming and proto-industries, see Parthasarathi (2001) writing about weavers in colonial India and mills in imperial Britain in the 19th century.

[14]To Watts (1994b), "contracting signifies both the advance of the industrial appropriation of rural production processes in the shift from agricultural production to agro-industrial production and of the social integration of agriculture associated with transnationalization" and again as "a form of industrial appropriation of discrete activities within the agrarian production process" (page 24).

could provide a space for a more coherent organization of empirical experience, and provide useful insights into policy making.

2.4 Imagining a Framework

As suggested by this review, existing frameworks, each on its own, might not be adequate to address all these aspects. They can be best described as imperfectly perceived parts of a whole phenomenon. Overall, while different approaches capture very relevant and important aspects of contract farming arrangements, in choosing to work with only a subset of them, they necessarily do not capture all the action. Those that focus on aspects such as global structural transformation tend to neglect the complexity of arrangements at the micro-level while those focusing on the micro-aspects of behavior tend to miss the drivers of transformation in agro-food systems at the macro-level. In reality, contract farming, at least in the developing countries, has emerged as an outcome of an interaction of macro and micro motives and behavior.

In this context, the scheme offered by Williamson (1991) and Delorme (1996) before him, suggest in fact that the economics of institutions is best understood as a layered concept, in particular operating at four different levels. According to Delorme (1996) and thereafter Kirsten et al. (2009), economic space can be organized according to logical levels so that an encompassing scheme, would comprise four levels of analysis organized in a logical order: agency, organizational forms, institutional forms and the level of the nature of interactions. It is then suggested that each theoretical sub-field in economics has a relative advantage over the others in explaining a particular level (Table 2.2).

Thus, while the study of embededness falls within the realm of social theory, property rights and political theory would be useful to examine the realm of institutional environment, comprising formal rules of the game, property rights and so forth. Williamson terms this layer first order economizing. The third level which involves the alignment of governances structures to transactions costs can be termed second order economizing, and transactions cost economics offers a useful tool

Table 2.2: Institutions as Layered Concepts

Level	Purpose	Theory
Embeddedness or Social Environment (for example, informal institutions, traditions, norms,religion,culture, sociopolitical imperatives)	Protect, preserve, empower	Social theory
Institutional environment (for example, formal rules of the game,property rights, laws, and constitutions)	First-order economizing create appropriate institutional environment	Economics of property rights Positive Political Theory
Governance: play of the game (aligning governance structure with transactions)	Second-order economizing create appropriate governance structures	Transaction-cost economics
Neoclassical analysis:performance (for example, optimality, prices, quantities, and incentives)	Third-order economizing create appropriate marginal conditions	Neoclassical economics (agency theory)

Source: Kirsten(2009). Adapted from Williamson (1991).

to do this. Finally, the analysis of third order economizing, that is, getting the marginal conditions right, is best served by neoclassical tools and agency theory.[15].

+ In this architecture, we have an encompassing framework, that provides the basis of thinking about a unified analytical framework for contract farming. It illustrates, in particular, how existing theoretical perspectives of contract farming shine a light on different 'levels' of institutions rather than on the whole. This thesis contends that if one has to understand the debate on the normative aspects of contract farming we need a theoretical framework that transcends these levels, accommodating all the levels. A theory of contract farming requires this reach. Recent reflections have, in principal, argued for precisely such frameworks (Dorward, 2001; Kirsten et al., 2009).[16] They argue for a coherent theory of contract farming that is more than the sum of these parts. Unfortunately, this has been developed only marginally further and there has been no serious effort at formalization.

[15]See Kirsten et al. (2009) for a detailed treatment of the economic study of institutions. Interestingly, early Williamson's treatise on transactions cost approach did not explicitly address the issue of embededness, notions of trust and so forth and drew criticism for this neglect. A later Williamson (1991) expands the reach of transactions cost approach by admitting different 'levels' of institutions.

[16]This framework has been applied innovatively by Saenz Segura (2006). In a related vein, Echanove and Steffen (2005) argue for a place-based analysis following Bebbington (2003) and Gwynne (2003),Gwynne (1999) and Gwynne and Kay (2000). Bebbington stresses the need to relate existing local level processes with decisions taken at completely different levels and which largely define what will happen locally while for Gwynne, the different scales of geographical resolution goes from the global to the local, via national and regional scales.

Thus, several questions remain. How can we restore what has slipped through the interstices of existing frameworks in a unified, eclectic, analytical framework? Is such arbitration even conceivable? In the next chapter, I explore this possibility and lay out the contours of such a theory.

Chapter 3

Towards a Unifying Theory of Contract Farming

The challenge of developing a unifying theory of contract farming that captures both static and dynamic diversity, and partial and general effects, requires a framework of institutional order but also a theory of change. In this chapter, I make a case for conceptualizing contract farming arrangements as institutions and for analyzing these contract farming systems within the comparative institutional analysis (CIA) framework as proposed by Aoki and Hayami (2001). While the core of this proposed 'theory' of contract farming is essentially neoinstitutionalist and centered on transactions costs, weaving it into the Aokian framework helps accommodate farmer-level processes and domain-level processes, and contextual specificities as well as changes exogenous to the system, implied, for instance, by macro-structural shifts in agrifood systems. In essence, this is to examine contract farming as institution within a specific framework of capitalist transformation and global integration. The goal is to achieve an 'additive' framework that accommodates aspects of behavior and motives at the micro and macro levels, in the fashion of the layered scheme presented by Williamson (Chapter 2). I suggest that this theory and the analytical framework it offers for empirical work helps us understand, more holistically, the emergence, evolution, sustenance (or not) of contract farming arrangements and also their remarkable diversity.

3.1 Contract Farming Systems as Institution

Contract farming was previously characterized as an arrangement involving an agribusiness firm coordinating backwards with farmers, through written or verbal contracts, providing farm inputs, credit and extension in return for guaranteed delivery of produce of specified quality often at a predetermined price.

While retaining this 'definition' of contract farming itself, it is possible to conceptualize a

contract farming *system* in broader terms.[1] A contract farming system as an institution is then not merely a technical arrangement between two or more economic agents. Rather, it is a set of rules and covenants, even outside of what is expressly agreed as part of a contract, that prevails over transactions in a particular domain. This domain admits an 'expanded' unit of analysis, for instance, an agro-economic system, cropping system, geographical or political region, or some sub-sector of the economy.

This characterization of contract farming as institution is admittedly a theoretical preference, rather than a prescriptive definition. The underlying motivation is to accommodate the idea that a contract in a contract farming system, far from being a mere economic transactional relationship, is a manifestation or representation of a relationship (Clapp, 1988; **?**). It is socially constructed, contested and negotiated in a way that the actual practice of contract farming connotes a broader socio-economic phenomenon. Its implementation then takes place in specific social and political contexts (White, 1997). An example of this distinction is when firms tolerate side selling of output or diversion of contracted inputs to non-contract crops; the farmer is, in return, accepting of the firm's control over aspects of production decisions.[2] This is a practice that has been incorporated tacitly into the larger scheme of things even though not strictly part of the contract itself (oral or written). In this case, it is a practice that enabled the particular contract farming system to maintain itself. Another example is where firms recruit middlemen to identify farmers to contract with (Eaton and Shepherd, 2001; Glover and Ghee Lim, 1992). This too has little to do with the actual contract itself. Neither is this a part of the exogenous environment even though it might be produced partly by it. However, it does fashion the substantive features of the contract farming system as a whole. A broader conceptualization of contract farming systems as institution aims to accommodate these features, especially acknowledging the fuzzy and crenulated boundaries of what is contractual and what is not. Needless to say, whatever the conceptualization, this has to be in reference to the specific context studied.

[1]The notion of a contract farming 'system' is regarded somewhat differently in early literature, as being disarticulated from the local polity and economy (de Treville, 1986). The word 'system' is used here precisely to incorporate these very things.

[2]Clapp (1994) interprets this arrangement in the Scottsian sense of such practice on the part of farmers being the weapons of the weak.

I now attempt to locate the discussion of agribusiness-farmer contracts, conceptualized as institution, within the analytical framework proposed by Aoki and Hayami (2001). I first offer a general, recitative overview of this framework, for the most part as exposited by Aoki (2000, 2007); Aoki and Hayami (2001); Aoki (1998).[3] Subsequently, I explore the way in which we can write discussions of contract farming into this framework.

3.2 The Conceptual Framework: Institutions as "Punctuated" Equilibria

The Aokian framework is part of a larger body of theory that constitutes modern institutional economics or neoinstitutional economics.[4] In general, if the economic process is analogous to a game, economists have regarded institutions variously as players of a game, as rules of a game or as an outcome of the game. Of these viewpoints, the latter two that have come to characterize much of the recent work in neoinstitutional economics.

The 'rules-of-the-game' view of institution, pioneered by North (1990), views institutions as exogenous and influencing individual agents' behavior.[5] The game here is a relevant economic process and the rules may be formal or informal. Formal rules are, in some sense, given prior to the playing of the game and are exogenous in the sense that it cannot be determined or fashioned by the players of the game. Existing rules then shape the incentives of the players and drive effective demands for new rules in response to changing relative prices. Accordingly, "polity" defines and enforces the economic rules of the game (North, 1995, page 23). Informal norms originate, on the other hand, in the social domain and constitute part of the "cultural heritage". The tension and interplay between the politically determined formal rules and persistent informal constraints influence the way economies change. The salient idea here is that institutions determine an agent's behavior.

The "equilibrium-of-the game" view endogenizes institutions and, in the tradition of methodological individualists, regards all institutions as outcomes of interaction of individual, maximizing agents (Greif, 1998). The core idea of the equilibrium-of-the-game view, which is antecedent to Aoki's CIA framework, is that rules are not all exogenously given, conditioned by polity or by

[3] This chapter draws extensively on these sources to reproduce Aoki's framework.

[4] There is a large and growing body of work on this area. Menard and Shirley (2008) offer a comprehensive review of perspectives.

[5] Hurwicz (1977) formalizes this notion.

culture but are endogenously created through interaction of the agents in a relevant domain and are thus self-enforcing (Greif, 1998). Institutions thus emerge as equilibria from an objective game, played by agents who are perfectly informed of the structure and outcomes, and make strategic choices with regard to their action. The strategy profile that emerges as the equilibrium is the institution. This idea is found in Schotter (1981) and is developed by Greif (1998); Greif et al. (1994), Milgrom et al. (1990), Weingast (1997) and Young (1998).

Aoki's framework synthesizes these two views, while aligning itself closer to the latter. Although adopting the view that institutions are the equilibrium outcome of a game, Aoki tempers this view by incorporating the idea that institutions 'embody' rules of the game. He proposes, therefore, what he terms the "endogenous-rules-of-the-game view". An institution is then "a compressed representation of the salient, invariant features of an equilibrium path, perceived by almost all the agents in the domain as relevant to their own strategic choices. As such it governs the strategic interactions of the agents in a self-enforcing manner and in turn is reproduced by their actual choices in a continually changing environment" (Aoki, 2001, pages 26 and 185).

Aoki's expository tool, the COASE Box, is worth reproducing here. Briefly, the objective game represented by Figure 3.1 is the one relevant to an individual agent and is defined over a domain. Belonging to this domain is a set of finite number of agents, its players. The entry, (A), is assumed to represent the set of all technologically feasible actions of agents in the domain, while entry (CO) is a consequence function that maps technologically feasible outcomes, contingent on some technologically feasible choice profiles, to observable consequences. These two sets of elements pertain to the environment that is not under the control of the agents (natural, technological, and external institutional, i.e., institutions in other domains), but affects the physical outcome of agents' choices. The set of agents, the set of technologically feasible strategies for each agent and the outcome function are the exogenous rules of the game.

Classical game theory then goes on to suggest that given the rules of the game (CO and A) and given expectations about other agents' strategic choices (E), the individual agent is assumed to make a strategic choice (S) to maximize own payoffs. The domain is in Nash equilibrium when the agents' expectations about other's strategic choices and their own actual choices are

Figure 3.1: COASE Box Representation of the Generic Structure of the Game

	Parametric Data (exogenous rules of the game)	**Endogenous Variables**
Internal to Agent (Micro)	(A) set of feasible actions	(S) strategic choice of an action (plan)
External Constraints (Macro)	(CO)consequence function	(E) expectation of others' strategic choices

mutually consistent. This equilibrium action profile constitutes the institution in a static setting. The equilibrium theoretic approach to institutions then suggests that an institution is a socially constructed state from which agents are not motivated to depart as long as others do not do so, and is in the nature of subgame perfect equilibria (Figure 3.2). The notion of evolution of institutions in this framework derives from either evolutionary game approaches that employs concepts of evolutionary equilibrium (Figure 3.3) or repeated game approaches that use concepts of perfect equilibrium, subgame perfect equilibrium or some variant of sequential equilibrium.

Aoki's endogenous-rules-of-the-game view departs from this in some fundamental ways. Importantly, Aoki dispenses with the objective game (that is at the core of the institutions as equilibrium outcome of the game view) and replaces it with a subjective game from the perspective of individual agents (Figure 3.4). The key assumption here is that the individual agent cannot have full knowledge of the technologically determined rules of the game nor can (s)he make perfect inferences about other agents' strategic choices. Instead, each agent's perception of the structure of the game is represented by a "subjective" game form.

In contrast to the objective game, rather than a technologically determined feasible set of actions, agents work with an "activated set of choices" (A), the agents' common perceptual representation of a strategy profile believed to prevail over the domain at a particular time.[6] Each agent then has a subjective outcome function. This serves as the agent's environment inference rule (CO). Both of these are in the nature of parametric data. Further, each agent plays the respective subjective game simultaneously. At any point of time, agents playing as they do, a subjective game,

[6]Note that Aoki does not view this as a *strategy profile*, per se, of agents playing the game, in the way it is in the equilibrium outcome of the game view.

Figure 3.2: COASE Box Representation of Subgame Perfect Equilibrium

	Parametric Data (exogenous rules of the game)	**Endogenous Variables**
Internal to Agent (Micro)	(A) complete knowledge of feasible (future) actions	(S) comprehensive strategic plan of contingent future action choices
External Constraints (Macro)	(CO) complete knowledge of the consequence function	(E) common beliefs regarding others' action on and off the paths of play.

Figure 3.3: COASE Box Representation of the Evolutionary Game

	Parametric Data (exogenous rules of the game)	**Endogenous Variables**
Internal to Agent (Micro)	(A) fixed sets of actions	(S) inertial imitation and mutation
External Constraints (Macro)	(CO) knowledge of "fitness" of strategies constructed from observations	(E) inference from limited memory (static expectation)

Figure 3.4: COASE Box Representation of the Subjective Game Model of an Individual Agent

	Parametric Data (exogenous rules of the game)	**Endogenous Variables**
Internal to Agent (Micro)	(A) activated subsets of choices	(S) best-response choice rule
External Constraints (Macro)	(CO) inference rule	(E) private beliefs
	(I) Institutions (shared beliefs)	

activate small subsets of possible actions, and choose a strategy from the activated set of strategies that, given a particular phenomenon of the institutions (or their reading of it) and their private beliefs (E), is predicted to maximize utility; this is the best response choice rule (S).[7]

When the agent repeatedly uses the same rules for environmental inference, payoff prediction, and choice, as well as the same phenomenal perception of institutions, we say that his/her subjective game is reproduced at the individual level (or in *cognitive equilibrium*).[8]. When agents perceive the phenomenon of the institution generated by the equilibrium as a relevant constraint, this equilibrium is sustained. Aoki then characterizes institutions as "substantive characteristics of self-enforcing rules for action choices by agents that are universally believed to be relevant in a repeated game situation"(Aoki, 2000, page 14).

The institution as a summary representation of an equilibrium path, according to Aoki, must possess the following attributes. First, institutions are *endogenously* created. Second, institutions *summarily represent salient features* of the internal working of the domain and thereby reduce the uncertainty regarding others' action-choice rules, so that an agent need not have knowledge or expectations about every aspect of other agents in the domain. The third attribute refers to the durability or *robustness* of an institution. An institution should be identified with something invariant within a certain bound or threshold of environmental and internal changes. This is associated with a robustness to minor mistakes experiments and deviance of the agents from institution's implied rules. Fourth, an institution is *universally relevant* in the sense that there is a common understanding and shared cognition amongst agents in the domain even though they may attach different meanings or interpretations to it. Fifth, institutions are humanly made orders, not technologically determined and there must be multiple ways of institutions being established under the same technological and ecological environment. The notion of *multiple equilibria* is

[7]Subjective games in this sense roughly correspond to the notion of 'mental models' adopted in the induction theory of Holland et al. (1989, page 12) i.e. as "models of the problem space" that cognitive systems construct, and then "mentally 'run' or manipulate to produce expectations about the environment.". Here, not only are interactions of such models with external environments, but also with those of other agents who act in similar ways. Denzau and North (1994) discuss the concept of mental models in some detail.

[8]More generally and realistically, it may be considered that the agent possesses multiple rules of inference and prediction at one time. These could be mutually competitive in some respects, complementary in others. Then, given a continually changing institution, the agent may experiment with each of them and choose the one that he or she considers appropriate under a given circumstance. However, when the sets of multiple rules remain to be stored as useful tools by the agents, we may still say that their subjective games are reproduced.

an essential aspect of institution that this framework seeks to capture. There could be different pathways to attain the same institution just as there can be different institutions themselves. The "endogenous-rules-of-the-game" view of institutions is consistent with these requirements. This describes the emergence of institutions and provides a framework of order for institutions.

The subjective game model then sets the basis for a discussion of institutional change or evolution. When an institution emerges from the subjective game, its reproducibility does not imply rigidity or stasis, in terms of how the subjective game is played. It is, in fact, consistent with and robust to agents' marginally changing the set of rules or random experimentation. When there is a gap between aspiration and prediction, then there is from the individual agent's view a subjective (cognitive) disequilibrium. Given agents' aspirations, they may start revising/refining the existing set of rules more substantially, in particular generating new choice rules involving the expansion of the activated set of choices. However, not all changes can actually generate a new institution. In other words, a change, at the margin, might alter an individual's subject game and outcomes, but need not necessarily alter the institution itself.

New institutions can evolve when the agents are then 'induced' to reassess and substantially revise 'subjective' sets of actions and rules for choices in a coordinated manner, consciously or unconsciously. This is what eventually leads to a new profile of moving equilibria and their substantive representations - new institutions. Figure 3.5 summarizes the mechanism of institutional evolution. From the left it deals with the choice of endogenous variables in the "old" subjective game, its feedback to the data of the old subjective game and its redefinition, and the emergence of the "new" institution. For institutional change to occur, however, a critical mass is required. This critical mass, can come either from external impetus that ruffles the exogenous rules of the game or parametric data, or it could be a internal cumulative effects relating to agents perceptions and cognition. This is taken up in greater detail in Section 3.3. Depending on the domain in focus, the process of institutional transition can be long or short, radical or gradual.

Thus, the essential idea of institutional evolution in the Aokian framework is that agents try to discover a new way of doing things, and through their interactions new institutions become self-organized. Once a particular institutional system is established, it tends to sustain itself. Change

Figure 3.5: The Mechanism of Institutional Evolution

Sustenance of an old institution		**Feedback to, and redefinition of the subjective game**				**Evolution of 'new' institutions**	
(S) action choice constrained by the activated subset of choice, the accumulation of neutral or sub-optimal mutations	$\longrightarrow$	(A) cognitive disequilibrium (perception of inadequacy of the existing repertory of action choices)	$\longrightarrow$	(S) experiment, learning, emulation of new choice		(A) redefinition of a new activated subset of choices	(S) novel action choice
$\Uparrow\Downarrow$		$\Uparrow$		$\Uparrow\Downarrow$			
(E) existing institution (a system of shared beliefs)		(CO) environmental changes (technological change, external shocks, exposure to outside markets, change in complementary institutions in neighbouring domains)		(E) crisis of shared beliefs, competing systems of predictive and normative beliefs		(CO) redefined, stable inference rules	(E) a new shared system of beliefs (a new institution)

in the system may be more likely to be initiated by 'sudden', discrete shocks rather than one that is slow and gradual, typical of evolutionary game theory. Characteristics selected during one point in time impose constraints on future possibilities (path dependence). The central thesis is therefore that institutions emerge as outcomes of a game, even while themselves influencing new rules of the game thereon. Institutional evolution is then analogous to the biological evolutionary process conceptualized as 'punctuated' equilibria,[9] rather than by a steady gradual Darwinian selection process. Institutional change is thus triggered on an episodic basis. A turbulent change with critical mass that causes institutional crisis, followed by a sub-period where choices are placed under evolutionary pressure of selection or vice versa, when minor experiments cumulate and beyond a threshold causes a flip in institutions. If the focus is the former, change seems radical and short, built around the point of punctuation. If not, the institutional change appears to be gradual.

3.3 Contract Farming as Frictional Equilibria

The Aokian apparatus of Comparative Institutional Analysis is particularly appropriate to frame the study of contract farming. To do this, I make use of the prevalent insights from transactions costs approach to institutions, the dominant analytical lens used by economists to view contract farming, along with key aspects of procedural rationality and learning processes.[10] I formalize aspects of this model in the next chapter. Here, my goal is to outline the rationale for this exercise, linking it in a limited way, to the empirical literature (discussed in Chapter 2). This offers, in a sense, a preview of the relevance of the Aokian CIA framework to the subject of this study.

I propose that at any given point of time, the snapshot view of a farm-firm relationship mediated by contracts represents "punctuated" equilibria in a sense to be elaborated. As firm and farm work to establish transactional relationships in a context of uncertainty and imperfect and incomplete information, the choices made by firms and farmers are produced as best responses

[9]This is due to Stephen Jay Gould and Niles Eldredge (1977).

[10]Procedural rationality entails the selection of information when more is available than an agent can process, but the agent chooses a mechanism constituting rationality of procedures used to achieve certain goals, resulting in satisficing behavior rather than a maximizing one. This is different from the conceptualization of bounded rationality, which is the notion that in decision making, rationality of individuals is limited by the information they have, the cognitive limitations of their minds, and the finite amount of time they have to make decisions. Aoki's thesis is framed within the context of bounded rationality. I adopt instead the concept of procedural rationality for this study.

to agents' subjective games. The firms' decisions would include, for instance, decisions on (1) whether to contract (2) how much to contract and (3) who to contract with or where and (4) how to operationalize the arrangement. Farmers' decisions would be with respect to his/her livelihood strategy in its entirety, including production and marketing decisions across a range of crops. In this setting, features and practices extraneous to the contract itself emerge to maintain (or destabilize, as the case may be) contract farming arrangements as institution. These choices then define and support substantive characteristics of a particular contract farming system, which then becomes an institutional feature. The attributes of a particular system are, as Aoki suggests, contingent on institutions in other domains as well, as also contextual specificities.

Working with the notion of the contract farming system as institution, the domain can be defined variously depending on the specific context. In a simple, illustrative setting, the agents are a contracting firm and farmers. In envisaging the farmers and firm as players, the firm has a particular interaction with each farmer. This is different from the way farmers relate to one another. Within the framework of the economics of information, this is akin to having one principal and many (and non-adversarial) agents. There may be other latent or passive agents in the system, who affect perceptions and thus agents' behavior.

Agribusinesses (or firms) would like to ensure a long term stable source of supply of produce. Typically these involve decisions regarding which source to use. In the Williamsonian frictional world of transactions costs, it is a question of whether the "make or buy" for the firm . In the context of agriculture, the issue is whether to (1) buy in the spot market, (2) vertically integrate and auto-source, or (3) choose some form of vertical coordination , typically through contractual agreements. Significantly, even the choice of vertical coordination is not unique i.e., a simplistic make versus buy or contract and firms could adopt plural structures.[11] This is true also of the firm's portfolio of contract farmers.

When relationships are mediated through contracts, oral or written, they are either 'take it or

[11]Much of the Williamson inspired literature on contract farming imagines a single continuum, parenthesized by corporate farming and spot market transactions at each end, but seem to neglect the possibility of plural choices by the firm. In fact, across a large number of case studies it is evident that firms often adopt multiple channels, contracting some part, auto-sourcing some other part and sourcing through spot markets simultaneously. Empirical examples are discussed in Reardon et al. (2009) and is addressed in some detail in Narayanan (2008).

leave it' contracts or could involve some bargaining and negotiation. The subjective game surrounds choices not only with respect to channels used but also regarding who to coordinate with if it is a contracting arrangement. Having decided to contract, and how much to contract, the companies need to decide who they would offer the contracts to and how they would operationalize and enforce the agreement. These could be sequential decisions, but are always interdependent.

However, the firm, like every other agent, operates in a world of uncertainty due to incomplete and imperfect information. For the firm, there is always a risk that the contractees may not honor the contract.[12] This moral hazard can come from lack of effort, diversion of inputs in case of production contracts, or selling elsewhere after harvest and once price is discovered in alternate channels. The firm then needs to accomplish two things: set the terms of the contracts to mitigate this risk and choose a set of farmers who are low risk. The firm's problem is then how to achieve a least risk arrangement at the lowest cost.[13] However, because of constraints on rationality and asymmetric information along with the uncertainties of agricultural production, the firm has only its own conception of the game that is played.

From the point of view of the farmer, the moral hazard arises, primarily, from the fact that the firm could reject their delivery on grounds of poor quality, timing, etc., attributes that are typically left unspecified in the contract or arbitrarily enforced. This is particularly the case when the firm, which needs a minimum procurement (say, to run the processing plant to the desired capacity) might also contract more quantity than they need, as a buffer, to guard against production risk for instance. This rejection at the factory gate has been cited as one of the most contentious aspects of the farm-firm relationship (Echanove and Steffen, 2005; Glover, 1987; Mannon, 2005). There have been documented instances of firms setting quality standards arbitrarily, becoming inexplicably stringent, if spot market prices collapsed. Sometimes, farmers have also had to bear the brunt of poor technical assistance, even plain cheating and deliberate default (Glover, 1987; Ramaswami et al., 2005). While not the rule, this is well within the realm of possibility.

Thus, while contracting provides farmers a way to mitigate price risks, it also entails a new

[12]This issue has been dealt with extensively in the literature. See **??**, for instance.

[13]Some of the transactions costs literature lumps costs of risk with other costs. In the context of contract farming relationships, a useful separation is to treat costs of risk from say, moral hazard, as different from other 'direct costs' of contracting. The tradeoff drives selection in interesting ways. This is taken up in detail in Chapter 4.

risk, the risk of rejection (Mannon, 2005; da Silva, 2005). This risk is subjectively evaluated by the farmer before contracting. Additionally the farmer might also evaluate the risk that the firm might not return the next season to contract. This is important, for instance, when the farmer would not want to sever the long-term relationship (s)he has with the village broker or trader.[14] Quite apart from this, for farmers, contract farming is part of a larger set of decisions that are made as part of the farmer's livelihood strategy. This involves making complex choices such as how to deploy family labor and land, and so forth.[15]

Given the context of uncertainty and constraints on rationality, and in the presence of what Williamson refers to as "opportunism",[16] the theory of incomplete contracts emerges as an inevitable development. The incompleteness of the contract thus gives companies, as it does farmers, some latitude in keeping their terms of the contract.[17] Thus, the agents in this stylized setting play a subjective game, given the exogenously determined context-specific constraints. The choices both have to make are multidimensional. This scenario is specifically one of double moral hazard which are factored into decisions via subjective assessments by both parties. Their choices then jointly determine the larger form and nature of the contract farming system that emerges, including relational elements to maintain the system.

The risk of rejection faced by the farmer and the risk of defection faced by the firm are, in fact, mutually dependent and this produces a space where the firm-farmer relationship is contested, negotiated and refashioned. I contend that, at any given point of time, a snapshot view of a contract farming system captures this tension or friction and hence represents frictional equilibria. It is frictional in that the leads to 'inefficiencies' relative to the first best case Leibenstein (1966). It is frictional too because it is an outcome of best responses or procedurally rational decisions in a frictional world, with uncertainty and transactions costs (Furubotn and Richter, 2005).[18]

[14]There could be other risks as well, such as risk of wrong advice, ecological damage, and so forth (da Silva, 2005).

[15]Echanove Huacuja (2003); Echanove and Steffen (2005), for instance, provides instances where farmers in Mexico try to minimize their risks by planting vegetables for two different companies and, on occasion, cultivating produce for the national fresh market .

[16]Opportunism is defined as self-interest seeking with guile. This is distinct both from mere self-interest seeking, which is consistent with satisficing behavior and from self-interest seeking with force.

[17]As Gow et al. (2000) observed, many firms actually prefer the incomplete contracts since it gives them greater flexibility.

[18]In this context, the 'nirvana fallacy' is relevant to empirical applications.The nirvana fallacy was given its name by economist Demsetz (1969, page 1), who said:The view that now pervades much public policy economics implicitly

To illustrate the mechanism of institutional evolution in this setting, I pick one aspect of the firm's decision, alluding to other aspects only peripherally. This is the selection, by the firm, of a set of farmers to contract with.

I suggest that in the first instance, the firms to adopt a portfolio approach, one that balances the need to minimize the transactions cost of contracting with many farmers and the need to choose a portfolio of farmers that minimizes moral hazard.[19] The portfolio is based on the firm's assessments, given known costs of transacting, as to who might be low risk suppliers, or this may be assumed to be revealed through proxy characteristics. For instance, in a study of Senegal peanut contracting, **?** found that companies used reputation ("social collateral"), making inquiries from villagers as to which ones were reliable. In others, eligibility conditions may be laid out somewhat more explicitly in terms of land holding, being debt free, experience with contracting, irrigation facility and so forth. This often involves a tradeoff, i.e., for example, large wealthy farmers might be low transactions cost but high moral hazard, small farmers may be low moral hazard but high transactions costs. This is likely why firms often contract with very different kinds of farmers (large, medium and small), even though there may seem to be more efficient ways of doing so, or even when there are known or recognized technical advantages for the firm in contracting with one rather than the other.

Thereafter, experience provides the information needed, so there is a learning process and a path of adjustment. From the firm's perspective, it is able to identify a 'stable' set of farmers to contract with. There could, in general, be considerable churning of the farmers selected for contracting, if the firm is trying to learn about the attributes of individual farmers (say, regarding quality of produce, repayment of credit, if relevant, and so on).[20]

From the farmer's perspective, the story is similar. Initially, the farmer takes a decision on whether to contract and may respond by a portfolio of options, e.g., part contracting, part spot-

presents the relevant choice as between an ideal norm and an existing 'imperfect' institutional arrangement. This nirvana approach differs considerably from a comparative institution approach in which the relevant choice is between alternative real institutional arrangements. In the context of uncertainty and bounded rationality, it is relevant to note, and has been argued as such, that outcomes of agents who are meliorizing or adopt procedural rationality cannot be regarded as inefficient.

[19] This is developed in Chapter 4.

[20] The issue of selection is addressed in Chapter 8.

market, or maintain more complex portfolios across crops, and in a broader sense, allocate labor across farm and off-farm activities. Over time, (s)he has the opportunity to learn about the trustworthiness of the firm or learning from others' experiences, and adjust choices.

The portfolio then changes over time until a stable equilibrium is attained. With a learning process, the best way to characterize these are as "moving equilibria". The stability of these equilibria is then contingent on several factors. As with the characterization of institutional evolution by Aoki, a change in institutions is predicated on the existence a critical mass that perceives subjective disequilibrium. It could happen in two ways (1) a drastic change in the environment, as a result of cumulative impacts of equilibrium sequences on the environment and pay-off distributions, or possibly by both (2) internal cumulative impacts.

As external triggering conditions, Aoki lists the following:

- New technological innovation occurs so that new choices become feasible. This could be a new seed technology for farmers, for example.

- External shocks, such as war, perceived productivity and innovation gaps with foreign competitors, prolonged depression, compel the agents to perceive a need for rapid improvement in productivity and other performance characteristics; This kind of change triggering institutional change is common enough. The case of Kenya's exports of fresh fruits and vegetables to UK retailers is an example. Dolan (2005); Dolan and Humphrey (2000); Dolan et al. (1999) suggest that the UK retailer deciding to procure produce from a cheaper source had the effect of practically dismantling livelihoods.

- A large scale institutional change occurs in a neighboring domain with which strong institutional complementarity exists. Glover and Ghee Lim (1992) describe the emergence of contract farming in Southeast Asia. In Malaysia, the implementation of vertical coordination, i.e., outgrower projects in rubber, accompanied resettling of laborers on land, an institutional change in another related domain. This enabled the emergence of stable contract farming in rubber.

- A large change in policy-determined parameters of the outcome function occurs. For example, if land ceilings for corporate farming are relaxed or subsidies for large scale corporate farming are put in place, it alters the relative costs of "make or buy" internal and external exchange. This is currently underway in both India and Pakistan, for instance. Also, the current policy in India strategy of Agri-Export Zone follows a cluster model that provides institutions and infrastructure and special regulations.

Alternatively, internal cumulative impacts might be one of the following

- Experiments with new choice rules that do not follow customs, have occurred in a cluster.
- Cumulative outcomes of repeated games have generated disparity in the distribution of assets, power and social roles, that are conceived of as 'unjust' and 'unfair' by a critical mass of agents in the domain. For instance, in early 2000, a group of farmers in Punjab got together and boycotted the firm that was contracting with them in response to perceived injustice. Contract farming was consequently abandoned in the area.[21]
- Repeated play of games according to certain external and endogenous rules of the game has induced the accumulation of competence and the capacities of agents that cannot effectively be employed anymore in the framework by those rules. A business executive recently said (translated) "we want to get out of contract farming, the farmers get better at it and want to pursue other options and then don't return".[22] Similarly, in Thailand, (Glover and Ghee Lim, 1992) observe that the success of the contract farming scheme is the very cause of failure. Farmers who became wealthier started investing in more lucrative avenues such as real estate. In a different case, degradation of soil quality consequent to recommended nutrient and pest management led to the firm abandoning contracting altogether in Mexico (Glover and Kusterer, 1990; Mannon, 2005) and in India.[23] This was endogenous environment degradation caused by the firm providing the inputs and technical advice.

[21]Personal communication with an agribusiness executive, Ludhiana, Punjab, India, March 2007.
[22]Personal communication with agribusiness executive, Madhya Pradesh, India, March 2007.
[23]Personal communication with an executive of a gherkins processing firm, Dindigul, Tamil Nadu, March 2007.

The mechanism of institutional change in this Aokian framework is quite inclusive. Changes don't happen only at the margin, hinging exclusively on individual agents' choices, or micromotives. It recognizes different sources of change exogenous to the system, or macromotives, in other institutional domains, for example. In fact, anything that can alter the subjective game is a potential catalyst. Shocks, represented by any of these, can thus destabilize the system and set in motion a new vector of moving equilibria, possibly in perpetuity. It is conceivable however that such a system evolve into a new stable institutional setting. This comes from the nature and magnitude of impetus, and how this interacts with other domains, given the specific context.

The importance of the 'critical mass' that leads to punctuation cannot be overemphasized. Nowhere is this more powerfully demonstrated than in Visconti's 1948 film *La Terra Trema*. In this story of impoverished Sicilian fishermen in Aci Trezza, wholesalers control the market, suppressing prices, unfairly. Toni who wants to organize his fellow-fishermen into a cooperative, fails to persuade them to stop fishing for the wholesaler. He chooses to follow his own path and invests in equipment and opts to free his family from the hold of the wholesaler. He succeeds, until a storm destroys everything they have. Ultimately, in a poignant scene, he returns to the fold, choosing to give up his autonomy and pride, to fish for the wholesaler again.

In the Aokian setting, the individual agent changed his choices, but this failed to alter the subjective game, in this case because of catastrophic but idiosyncratic exogenous factors. Altogether, the substantive features of the institution did not change. As Aoki elaborates "A search for the re-definition of the subjective game can be initiated by an individual agent who perceives new opportunities even under a fairly stable environment. If proven successful, such a redefinition may be emulated by other agents and eventually become self-organizing as a spontaneous order. But, when the performance characteristics of the domain are satisfactory and no significant gap is perceived by the agents, the impact of such an entrepreneurial mutation may be limited" (Aoki, 1998, page 18). It explains why some systems are resilient to changes.

Equally, it also allows the possibility that in stable systems, actors change without subjective game changing, for example, a state organization transferring ownership and operation to a private firm. Or in other instances, the same institution could merely develop new or different roles.

On the other hand, sometimes, agents can take action precisely to sustain a particular institution and to avoid altering the nature of the subjective game. Clapp's (1994) example again of firm and farm willing to tolerate deviation from contract the contract terms to a limited extent, in the interest of a lasting relationship is illustrative of this. There have been instances too where in the face of a huge collapse in spot market prices, firms still honored the contracts as a trust-building measure taking a huge loss, although it would have been more (immediately) profitable to renege. In some cases, firms bear losses, just to honor contracts to maintain farmer trust. This is reminiscent of the Folk Theorem result in a repeated game setting. The existence of such a 'moral' economy of the contract is elaborated in Chapter 11.

The chief merit to this approach to studying contract farming is that it offers different organizing principles. Within economics, so far, much attention has been paid to taxonomic approaches, identifying sets of conditions under which one kind of contracting emerges over another. This framework is also encompassing in the sense that it can address multiple levels of institutions (as suggested by Dorward (2001) and Williamson (1991)in one coherent framework.

The Aokian Comparative Institutional Analysis framework enlarges the scope of theory to include admit substantial static (in Aoki's words, "synchronic") and dynamic ("diachronic") diversity that marks contract farming systems. Institutional equilibria are characterized by both path dependence and novelty since, at the critical juncture of the change, the choice rules of agents imposing constraints on future possibilities. By showing the possibility of multiple equilibria in specific models the endogenous-rules-of-the-game approach is able to shed light on the 'humanly devised' nature of institutions within specific contexts, rather than institutions that are products of technological, ecological or cultural determinism. It is capable of explaining why not all contract farming schemes are sustainable. In the extreme, it can lead to the firm abandoning contract farming altogether or to complete vertical integration on the other.[24] In particular, it is now possible to analyze how even from the same starting point, a contract farming system can evolve along different trajectories, based on the adjustment or learning path. This is evident in the contract farming literature. Similarly, this framework, also enables us to track agrarian transformation as

[24] As Minot (1986) points out, unsuccessful examples in contract farming are rarely documented.

manifest is social differentiation. As an example, the composition of the portfolio farmers selected into contract farming systems might influence the kind of system that has evolved. It can lead to peasant differentiation or polarization or homogenization.

The Aokian framework also accommodates a theory of change that is hinged on history and contextual specificity. It illustrates the importance, and indispensability, of combining historical and socio-political contexts in the reading of why, say, in Aci Trezza, an institutional transformation did not occur, while it did occur in the Punjab village. In fact, by addressing the interdependencies of institutions, this theoretical approach challenges ideas of institutional transplant, recognizing that social and political contexts that can have unintended or unanticipated consequences (for example how contract farming in Thailand, Malaysia and Indonesia all had different outcomes). Whether a new institution is mutually consistent with the broader context determines its viability in the original intended form. This is conceptualized by institutional linkages and complementarities. The Aokian framework enables a more rigorous analysis of all these issues, emphasizing "conditional robustness and the multiplicity of such arrangements".

The Aokian perspective of institutional change suggests that when agents operate in a constantly changing environment marked by uncertainty, frictional forces operating within an economic system imply that an equilibrium end-state is not reached instantly, and there is search for additional information that enable agents to improve upon the choices they make at a particular point of time. Thus "actors are seen to meliorize rather than maximize" (Brinton and Nee, 1998, page 10) and in Simon's framing, agents are procedurally rational, but not substantively rational (Simon, 1961). The fact that individuals experiment and learn is far closer to human behavior than an agent capable of working through the complex objective game structures to choose an optimal strategy. Learning and experimentation thus have an important role to play. In the context of this CIA framework, Aoki does not explicitly discuss learning rules. Like the framework itself however the learning process ought be general enough and realistic, at the same time be tailored to the context. An institution is thus "the product of a long term experiences of a society of boundedly rational and retrospective individuals"(Kreps, 1990, page 183). Furthermore, rather than a unique path, branching out along multiple paths may be possible (Aoki, 1998). Therefore, for an understanding

of the mechanism of institutional change, Aoki maintains that careful empirical studies based on historical and comparative information are necessary to sort out what major factors are influencing the selection of a particular trajectory instead of other possible ones.

While solving some of the perceived problems of existing neo-institutionalist analytics, the Aokian framework raises a few problems of its own, the main one being the degree to which it allows formalism. Aoki's framework is however sufficiently flexible to serve as material for context-specific modeling. As Aoki suggests, the choice of methods depends on the purpose and goal of the analysis itself.If nothing else, it captures the spirit of empirical work on contract farming better than alternative frameworks do. The next chapter sketches a theoretical model, but one that captures the essential flavor of the Aokian framework. The model represents a reworking of standard neoclassical models to accommodate the notion of contract farming as frictional equilibria, and constitutes an elementary analytical model useful for empirical analysis.

Chapter 4

Formalizing the Notion of Contract Farming as Frictional Equilibria

This chapter presents an effort to formalize the notion of contract farming as frictional equilibria over a domain, with a view to providing a basis for the empirical work in this study.[1] It has modest goals. The first is to demonstrate the manner in which the constituent parts of the composite one-shot principal-agent model can be addressed separately in a way that is useful for empirical analysis. The second is to indicate how these pieces fit together, commenting on the nature of friction in the system, at each stage of the contracting process. The purpose is therefore not to present a theoretical model for how contractual terms are established, nor to derive specific testable hypotheses to take to data. Rather, the goal is to provide the underlying analytics of the empirical work that informs the econometric approaches used in this study as well as in the interpretation of key results. In that sense, this chapter offers a structure that highlights key features of a contracting scheme as systemic or domain equilibria, by mapping the different stages of the contracting process as described in Figure 1.1.

4.1 The Contracting Stage

In the contracting stage, firm and farmers are assumed to arrive at an acreage to contract, based on what each considers to be an optimal allocation.[2] This vector of contract acreage over the domain, or the acreage contracted by the firm from N farmers at time t, can be represented by a set $\{a'_{it}\}_{i \in N}$ where a'_{it} for each farmer is the lesser of two quantities: what the firm is willing to offer a farmer ($\hat{a}_{it}$) and what the farmer is willing to commit under a contract (a^*_{it}). If $\bar{a_{it}}$ is the endowment of

[1] One of the weaknesses of neoinstitutional approaches to studying economic phenomena has been the relative neglect of formalization of its core ideas and its applications.

[2] Contracting can be based both on volumes and on the basis of acreage. I assume acreage is contracted, given the practice in India, the site of empirical work in this study. I also assume that these are for field crops.

land for farmer i so that this is the feasible maximum contract acreage, the vector of contracted acreage over the contracting domain can be given as

$$a'_{it} = \text{Min}\{a^*_{it}, \hat{a}_{it}\} \in [0, \bar{a_{it}}] \text{ for i =1 to N} \tag{4.1}$$

a^*_{it} and $\hat{a}_{it}$ are the optimal allocations, respectively, from the farmer's contract allocation problem and the firm's problem of determining acreage allocations across N farmers, which are developed in the chapter. Some elements in the set could be zero, for farmers who do not want to contract at all and for farmers who might have wished to contract but the firm has not selected. This contracting decision, of how much to allocate to the contract crop, involves agents optimizing over a set of choices available, based on the beliefs they hold about the reliability of the contracting partner(s) as well as on general market conditions.

4.1.1 The Farmer's Problem

A farmer's decision to contract involves deciding on the acreage (s)he is prepared to allocated to the contract commodity. Given that the returns at the end of the season is variable and assuming that a farmer is a risk averse, expected utility maximizer, the farmer i selects an acreage $a^*_{it} \in [0, \bar{a_{it}}]$ such that it maximizes expected returns at the end of the season. Given that $\bar{a_{it}}$ is the total land available to the farmer, the land a farmer can devote to non-contract crops is $\bar{a_{it}} - a^*_{it}$. This can be either the contract crop itself grown for the spot market or some other crop altogether. Let the quantities produced under contract and otherwise be denoted by random variables $\tilde{q_{ict}}$ and $\tilde{q_{imt}}$, respectively. Assume that the production function associated with contracting and not contracting are given by standard concave functions, f and g and are common to all producers, though this latter assumption is not critical.

$$\tilde{q_{ict}} = f(a_{it}, z_{it}, l_{it}\phi_i, \epsilon_i)$$
$$\tilde{q_{imt}} = g(\bar{a}_{it} - a_{it}, z'_{it}, \bar{l_{it}} - l_{it}, \phi'_i, \epsilon'_i)$$

where, z_i and z_i' are the inputs allocated, l_i and $\bar{l_i} - l_i$ are the labor allocations on the contract and non-contract plot, ϕ_i, ϕ_i' refer to random variables representing idiosyncratic shocks in the production of the contract and non-contract crop, and ϵ_i, ϵ_i' refer to those representing covariate shocks associated with the contract and non-contract crop. For the sake of simplicity, I assume that the farmer only makes a land allocation choice assuming away the problem of input choice.[3]

Let P_{ct} be the unit contract price announced by the firm and P_{mt} the random spot market or alternate price for the contract commodity (or the price of the closest alternative to the contract commodity, from the farmer's perspective). The returns at the end of the season for the farmer is the sum of the net revenue from contract acreage and the sum of the net revenue from the non-contract acreage. Suppose, in addition, the farmer holds some beliefs about the firm's reliability, denoted by a parameter $\alpha_{it} \in [0, 1]$. In other words, the farmer believes that firms might take actions that potentially reduce contract revenue, by discounting the price, rejecting produce, etc. and α_{it} represents the proportion of the total potential contract revenue that the farmer is left with. Note that if the farmer completely trusts the firm, $\alpha_{it} = 1$, and the farmer expects to earn the entire anticipated potential revenue. Incorporating costs of cultivation (now, as unit costs of production, given that the input allocation problem is assumed away) and transaction costs and denoting these by C_{ct} for contract cultivation and C_{mt} for non-contract cultivation, the farmer now solves the following problem[4]:

$$\underset{a_{it}}{\text{Max}}\, E_t U_i \Big[\alpha_{it}(P_{ct} - C_{ct})\tilde{q_{ict}} + (P_{mt} - C_{mt})\tilde{q_{imt}}\Big]$$

subject to

$$\begin{aligned} \tilde{q_{ict}} &= f(a_{it}, z_{it}, l_{it}\phi_i, \epsilon_i) \\ \tilde{q_{imt}} &= g(\bar{a_{it}} - a_{it}, z_{it}', \bar{l_{it}} - l_{it}, \phi_i', \epsilon_i') \\ a_{it} &\in [0, \bar{a_{it}}] \\ l_{it} &\in [0, \bar{l_{it}}] \end{aligned}$$

[3]The level of inputs is usually codetermined alongside acreage under contract and typically, most non-labor inputs are supplied by the firm. These are not modeled here.

[4]These costs are assumed net of any cost of inputs that is borne by the firm, denoted by C_{izt}. This is not explicitly mentioned here to keep the notation simple.

where E_t is the expectations operator. This is a standard portfolio allocation problem between uncertain alternatives, represented by the random returns to contracting and not contracting. Assuming this to be a concave utility function, that comes from risk aversion of the farmer, the first order conditions are necessary and sufficient.

Making the simplifying assumptions, that broadly reflect most developing country contexts, that the farmer will never allocate all of his/her land or family labor to contract cultivation, the solutions that are considered are $a_i = 0$ and $a_i \in (0, \bar{a_i})$. We get the conditions that whenever a_i^* at the optimum is in the interior, it must be true that

$$E_t \frac{\partial U_i}{\partial(.)} \left[\alpha_i (P_{ct} - C_{ct}) \frac{\partial f}{\partial a_i} - (P_{mt} - C_{mt}) \frac{\partial g}{\partial a_i} \right] = 0 \tag{4.2}$$

This condition implies that the farmer devotes as much acreage to contract cultivation as to equate marginal net returns from contracting to that from not contracting.

When a farmer does not devote any acreage to the contract crop so that $a_i^* = 0$, the first order condition consistent with this case implies[5]

$$E_t \frac{\partial U_i}{\partial(.)} \left[\alpha_i (P_{ct} - C_{ct}) \frac{\partial f}{\partial a_i} - (P_{mt} - C_{mt}) \frac{\partial g}{\partial a_i} \right] < 0 \tag{4.3}$$

In general, the optimal contract acreage allocation a_i^* which solves these problems, assuming that the associated functions are well-behaved, can be expressed as

$$a_i^* = a(\bar{a_i}, \bar{l_i}, \alpha_i, P_{ct}, P_{mt}, C_{ct}, C_{mt}, \phi_i, \phi_i', \epsilon_i, \epsilon_i') \tag{4.4}$$

This represents the intensity of farmer participation or the quantity of land allocated to the contract commodity. It is easy to see from the first order conditions, that the acreage allocated to contracting would be positively related to the contract price, the productivity associated with contract production and the perception of the reliability of the firm. In many empirical contexts, contract production is often associated with productivity increases, given that inputs and advice are

[5] In presenting these conditions, I use strict inequalities assuming that the Lagrangian multipliers associated with the relevant constraints are strictly positive.

provided by the firm. Similarly, a farmer's perception of whether the potential profits will accrue fully or not are important factors in acreage allocation. The first order conditions also suggest that the higher the expected net returns to the alternative relative to that for the contract crop, the lower the acreage allocated to contract crops. From the perspective of mapping correlates of farmer decisions on contract acreage, Equation 4.4 presents a reduced form for econometric estimation of intensity of farmer participation. Further, depending on whether the optimal allocation is non-zero or zero, in the context of empirical work, this can be recast as a binary variable that conveys extensive participation.

Within the expected utility framework, it is possible to represent this choice as a function of higher-order moments of the random returns, by Taylor expanding around the mean. Very often, farmers compare distributions rather than just the means of the distributions. Chapter 7 probes this aspect further and conducts an analysis, comparing entire net returns distributions associated with contracting and not contracting, as perceived by the farmer and the perceptions of the multiple components of risk that are encapsulated in the term α_{it}.

4.1.2 The Firm's Problem of Choosing a Portfolio of Farmers

While farmers work out the calculus of optimal contract allocation,contract firm independently assesses the best way to build a portfolio of contract suppliers who represent the least risk of non-delivery at minimum cost. The firm decides on the acreage to allocate to select farmers from among N farmers.

Let $v_{it} = P_{rt} - P_{ct} - C_{izt}$ be the revenue earned per unit from processing and selling the contracted produce downstream. This is represented as the price obtained by the firm for the final product P_{rt} minus the contract price P_{ct} paid for the produce and any costs that the firm incurs on providing inputs to the firm C_{izt}.

The production function f of individual farmers is assumed to be known by all, and is therefore the same as in the farmer's problem. For notational ease, it is expressed as a function of only a_{it} rather than all the relevant variables. The firm might have expectations regarding yields and expect a certain quantity to be produced from a given acreage alloted to farmers. In addition,

it holds beliefs about the reliability of farmers, on whether the contracting farmer would deliver at harvest time all the produce from the contracted acreage. Let $\theta_{it} \in [0,1]$ denote a subjective parameter of farmer reliability that the firm holds. It is the proportion of total contract produce that the firm expects farmer i to deliver in reality. In a sense, the firm anticipates that a certain proportion might either not meet quality standards or that the farmer might side-sell after harvest. The firm would factor this into consideration while choosing farmers.

Further, the firm also expects to incur transactions costs, a major portion of which in transportation costs, for evacuating contracted produce at harvest time. This remains unknown at the time of contracting and enters as expected costs. It could also include costs of negotiating and entering into contract, as also supervision and monitoring costs. One part of this cost is denoted as $t(\theta_{it}f(a_i))$ which increases in the volume evacuated from farmer i and is summed over all those with a non-zero contract acreage, i.e., $n \subseteq N$. The other component is a function of the scale of operation. To account for the possibility that it is often less expensive to contract with fewer number of farmers, a part of the cost is regarded a function of $n \subseteq N$ where n refers to number of farmers who contract a positive quantity and N denotes all the farmers in the contracting domain. The number of farmers n with whom the firm contracts (representing the scale of operation) is endogenously determined and is a function of the $\{\theta_{it}f(a_{it})\}_{i\in N}$ such that the higher the perceived reliability of farmers, the lower the number of farmers with whom the firm needs to contract, or larger the scale of production, the fewer the number of contract farmers a firm needs. The expected transaction costs can then be expressed as,

$$E_t\left[h\left(n(\theta_{1t}f(a_{1t}),\ldots\theta_{Nt}f(a_{Nt}))\right)+\sum_{i=1}^{N}t(\theta_{it}f(a_i))\right] \tag{4.5}$$

where,

$$\frac{\partial h}{\partial n}>0$$
$$\frac{\partial n}{\partial \theta_{it}}<0, \frac{\partial n}{\partial f(a_{it})}<0 \forall i$$

Further, the firm requires expected evacuated volumes ($\sum_1^N \theta_{it} f(a_{it})$) to meet a capacity condition, that there is enough to run the plant $\underline{Q}$ but not exceed the maxiumum capacity $\bar{Q}$.

The firm thus chooses a portfolio of farmers, allocating $\hat{a_{it}}$ to a subset of n farmers among the N farmers in the contracting domain, by solving the following problem.

$$\underset{a_{it}}{\text{Max}} \sum_{i=1}^{N} v_i \theta_{it} f(a_{it}) - E_t[h(n) + \sum_{i=1}^{N} t(\theta_{it} f(a_{it}))] \tag{4.6}$$

$$\text{subject to} \sum_{i=1}^{N} \theta_{it} f(a_{it}) \in [\underline{Q}, \bar{Q}] \tag{4.7}$$

$$a_{it} \leq a_{it}^* \forall i \in N \tag{4.8}$$

The last constraint comes from the farmer's optimization exercise for contract acreage allocation. From the farmer's problem, we know that

$$a_{it}^* = a(\bar{a_{it}}, \bar{l_{it}}, \alpha_{it}, P_{ct}, P_{mt}, C_{ct}, C_{mt}, \phi_i, \phi_i', \epsilon_i, \epsilon_i')$$

These variables that drive farmer's allocation of contract thus enter the firm's problem of choosing farmers via the farmer level constraint. There are N such constraints for the firm. The solution to this problem is the optimal portfolio of the firm and is denoted as $\{\hat{a}_1, \ldots, \hat{a}_n\}$.[6]

For the purpose of this work, I highlight a few key results. Assuming solutions are in the interior so that the total expected volume the firm procures lies in the interior of the capacity condition, the first order condition associated with a firm allotting at least some contract acreage to a farmer i i.e., $\hat{a}_{it} \in (0, a_{it}^*)$, it must be the case that

$$\overbrace{v_i \theta_{it} \frac{\partial f(a_{it})}{\partial a_{it}}}^{\text{net revenue}} - \theta_{it} E_t \frac{\partial f(a_{it})}{\partial a_{it}} \left[\overbrace{\frac{\partial h}{\partial n} \frac{\partial n}{\partial \theta_{it} f(a_{it})}}^{(-)} + \overbrace{\frac{\partial t}{\partial \theta_{it} f(a_{it})}}^{(+)} \right] = 0 \tag{4.9}$$

The first order conditions imply that the marginal net benefit from increasing contract acreage

[6] When this constraint explicitly enters the firm's problem the optimal contracting volume represented in Equation 4.1 is in fact $\{\hat{a}_1, \ldots, \hat{a}_n\}$.

to a farmer is weighted by the reliability parameter, as are the expected incremental transactions costs of doing so. The marginal net benefit from increasing contract acreage accrues through two channels. First is the unit return to the expected produce from farmer i net of input costs and price for the produce. This is the first term. The second channel is through expected savings on account of higher intensity of procurement through a contract farmer rather than from an additional farmer in the firm's portfolio, so that the expected costs of evacuation is spread over fewer farmers. This is represented by the term in the middle. The third term reflects the marginal expected costs on evacuating produce from the additional acreage contracted. In reality, this dynamic between expanding on the extensive margin and the intensive margin is quite important when firm choose their portfolio of farmers. There two opposing factors. On the one hand, contracting a higher acreage from a particular farmer entails an increase in expected costs of procurement, but also an opposite effect in terms savings in cost since the firm does not deal with the costs of transacting with an additional farmer, an equivalent volume.

Supposing at the optimum, constraint on an individual farmer's acreage is binding, so that $\hat{a}_i = a_i^*$ for this to be optimal, it must be the case that

$$v_i \theta_{it} \frac{\partial f(a_i)}{\partial a_i} - \theta_{it} E_t \frac{\partial f}{\partial a_i} \left[\frac{\partial h}{\partial n} \frac{\partial n}{\partial \theta_{it} f(a_{it})} + \frac{\partial t}{\partial \theta_{it} f(a_i)} \right] > 0 \tag{4.10}$$

The firm could do better by contracting more acreage from the farmer, but is rationed on the intensive margin by the farmer.

Rearranging terms from the first order conditions associated with an interior solution, for any two farmers, say, i and j, from whom the firm procures, we get

$$\frac{\theta_{it} \frac{\partial f(a_i)}{\partial a_i}}{\theta_{jt} \frac{\partial f(a_j)}{\partial a_j}} = \frac{v_j - \left[\frac{\partial h}{\partial n} \frac{\partial n}{\partial \theta_{jt} f(a_{jt})} + \frac{\partial t}{\partial \theta_{jt} f(a_j)} \right]}{v_i - \left[\frac{\partial h}{\partial n} \frac{\partial n}{\partial \theta_{it} f(a_{it})} + \frac{\partial t}{\partial \theta_{it} f(a_i)} \right]} \tag{4.11}$$

This is the core result of the model in its simplest form. The firm faces a tradeoff between risk of reneging that it associates with a farmer and the transactions costs associated with contracting with the particular farmer, given levels of productivity. When there is an interior solution, it would

balance the risks of reneging with the transactions cost in a way that the ratio of the two is equated across the farmers with whom the firm chooses to contract. If the firm has to contract at least some non-zero output from both i and j, it is necessarily true that if one is more costly to transact with (implying a lower marginal net revenue), the other is more risky to procure from, given comparable productivity. This is the tradeoff between higher transaction cost and risk.

When a farmer j is excluded, and a farmer i is not, the first order conditions imply,

$$\frac{\theta_{it}\frac{\partial f(a_i)}{\partial a_i}}{\theta_{jt}\frac{\partial f(a_j)}{\partial a_j}} > \frac{v_j - \left[\frac{\partial h}{\partial n}\frac{\partial n}{\partial \theta_{jt} f(a_{jt})} + \frac{\partial t}{\partial \theta_{jt} f(a_j)}\right]}{v_i - \left[\frac{\partial h}{\partial n}\frac{\partial n}{\partial \theta_{it} f(a_{it})} + \frac{\partial t}{\partial \theta_{it} f(a_i)}\right]} \tag{4.12}$$

This condition, evaluated at $a_{jt} = 0$ implies that at the optimum, the advantage the i has over j in terms of greater reliability or productivity or both outweighs the relative advantage j might have over i in terms of lower transactions cost or marginal expected benefit.

The firm's choice of a portfolio of contract suppliers is thus interdependent and selection is on comparative terms. The separation of participants from non-participants happens not in the absolute sense but in a relative sense. This is particularly important since much of the empirical work on farmer participation does not explicitly lay out this interdependence.

This analytical model has non-trivial implications for empirical analysis. First, if this is the underpinning process by which farmer participation in contracting is determined, i.e., as a matching problem, then an econometric specification would necessarily have to account for the individual farmer's optimization exercise that enters as a constraint in the firm's model for choosing contract farmers. This would include the incorporation of not just farmer's land and labor endowments but importantly, their perception of the firm's reliability and risks associated with contracting as well as the next best alternative. Second, the set of first order conditions from the above model of farmer selection suggests interdependence of farmer selection, that firms equate the relative reliability and costs of contracting with the selected farmers across the domain. In econometric terms, this implies that a model of farmer participation must account for such interdependence, represented by potential correlation of errors across observations. Chapter 8 that deals with extensive participation in contracting schemes is based on this analytical model.

This model provides a basic structure that can be modified for specific contexts. For example, This model allows for the possibility of the phenomenon of "strategic overcontracting" (Barrett et al., 2010) To see this consider the case where the Capacity Condition is binding at the upper bound $\bar{Q}$ so that $\sum \theta_{it} f(\hat{a_{it}}) = \bar{Q}$. If it is the case that all farmers are able to deliver a proportion, say, $\theta_t^* \geq \theta_t$ with this condition holding with strict inequality for at least one farmer, at the honoring stage, the firm would have contracted a volume greater than the capacity they are capable of processing.[7] It can also extended to several other settings as well, on how firms might choose regions to procure from rather than farmers. It could also be applied to the firm's choice of farmer groups or lead farmers or intermediary-consolidators to contract with. It could also be applied to decisions further downstream players, that is a supermarket's choice of suppliers. In that sense, this is a fairly general framework that can be used for context-specific modeling.

4.1.3 Contract farming as frictional equilibria

Over the contracting domain, the equilibrium is characterized by a set of subjective beliefs $\{\alpha_{it}, \theta_{it}\}_{i \in N}$ on the mutual reliability of contracting partners and beliefs held about the state of nature, and a vector $\{a'_1, \ldots a'_N\}$ that represent the minimum of each element of two vectors, $\{\hat{a}_1, \ldots \hat{a}_N\}$ that is the optimal contracting portfolio for the firm and $\{a^*_1, \ldots a^*_N\}$ that each represent the optimal allocation of the farmers in the domain. The farmer's choice vector is redundant if it is folded into the firm's problem as a constraint on the maximum that the firm can contract from farmers, so that $\{\hat{a}_1, \ldots \hat{a}_N\}$ is the contracting acreage vector over the domain of N farmers. The friction comes from the fact that this equilibrium, based on subjective beliefs, does not necessarily clear markets in the traditional sense.

4.2 The Honoring Stage

The honoring stage marks the time when nature has resolved the uncertainties, so that the output of each farmer is now revealed, as are the spot market prices or alternative prices for the contract

[7] This could lead to rejection of produce by the firm expost at the honoring stage. This is discussed in the Section 2 of this chapter.

commodity. Farmers now decide how much of the harvested crop they would want to deliver to the contracting firm. In theory, contracts bind farmers to deliver all of it. In practice, sideselling on account of weak public enforcement or insufficient incentives to honor, is an important source of friction. Firms too need to decide how much of the contracted volume they will evacuate. When contracting, firms typically estimate total volumes likely to be delivered. If it is relatively good harvest and/or market prices are low (the two are often related), the firm ends up with contractual deliveries that are potentially larger than the capacity they can handle. This was raised earlier as the problem of strategic overcontracting. Under these circumstances, firms often end up rejecting deliveries or failing to show up to evacuate produce from the farmgate. Here, again, as with contracting decisions, friction is introduced on account of actions by both the farmer and the firm.

4.2.1 Farmer's decision to honor

Let $\theta^*_{it} \in [0,1]$ be the proportion of contracted produce that the farmer delivers. At the end of the season, upon harvest at time t, when the uncertainty regarding the market price and yields have been resolved, the farmer chooses to deliver contractual volumes to the firm based on the utility in the current period and the current value of continued contractual relationship in the next period. $\theta^*_{it} = 0$ implies perfect non-compliance wherein the farmer sidesells all of the contracted volume and $\theta^*_{it} = 1$ implies perfect compliance. This proportion emerges as a solution to the farmer's honoring problem. Simply,

$$\theta^*_{it} = \arg\max_{\theta_{it}} E_t \left\{ U_t(\theta_{it}) + \beta V_{t+1}(\theta_{i,t+1}) \right\} \tag{4.13}$$

Given that at time period t, uncertainties regarding prices are resolved, assuming that the utility function is separable over time, θ^*_{it} is the solution to the problem

$$\underset{\theta_{it} \in [0,1]}{\text{Max}} \; U_t(\theta_{it}) + \beta \left\{ E_t V_{t+1}(\theta_{i,t+1}) \right\} \tag{4.14}$$

$\theta_{i,t+1}$ is the expectation the firm has about the farmer's reliability at time period $t+1$. Recall that when the firm contracted with the farmer i, the firm presumed a certain level of reliability θ_{it}

associated with the farmer, denoting the subjective expectation of the firm as to the proportion of the produce from the contracted acreage the farmer would deliver. Supposing now, the firm uses the farmer's choice at t, θ^*_{it}, as a basis to revise and update its belief about the farmer's reliability before contracting for the next period, then $\theta_{i,t+1}$ is a non-decreasing function of θ^*_{it}, *ceteris paribus*.[8] This implies that when a farmer is seen to deliver a higher proportion of produce from the contracted acreage, the more likely the firm is to consider the farmer a reliable supplier in the future time period. Rewriting θ_{it+1} as a function of θ_{it}, for an interior solution, where $\theta^*_{it} \in (0, 1)$, the first order condition implies, that at the optimum θ^*_{it}, the following holds.

$$\frac{\partial U_t(\theta_{it})}{\partial \theta_{it}} + \beta E_t \frac{\partial V_{t+1}(\theta_{i,t+1})}{\partial \theta_{i,t+1}} \frac{\partial \theta_{i,t+1}}{\partial \theta_{it}} = 0 \tag{4.15}$$

Similarly, full compliance, i.e., when $\theta^*_{it} = 1$, it must be true that at the optimum,

$$\frac{\partial U_t(\theta_{it})}{\partial \theta_{it}} + \beta E_t \frac{\partial V_{t+1}(\theta_{i,t+1})}{\partial \theta_{i,t+1}} \frac{\partial \theta_{i,t+1}}{\partial \theta_{it}} > 0 \tag{4.16}$$

If the farmer decides to honor the contract in full, it must be true that there are positive benefits to complying with the contract. Further, whenever, there is non-compliance so that $\theta^*_{it} = 0$, the first order conditions imply that at the optimum,

$$\frac{\partial U_t(\theta_{it})}{\partial \theta_{it}} + \beta E_t \frac{\partial V_{t+1}(\theta_{i,t+1})}{\partial \theta_{i,t+1}} \frac{\partial \theta_{i,t+1}}{\partial \theta_{it}} < 0 \tag{4.17}$$

This basically suggests that the sum of the marginal benefit from an increase in the proportion of produce delivered on contract and the consequent value of expected future benefit is negative, so that the farmer is left worse off by the decision to improve his or her contractual performance.

There are specific cases that are of interest depending on the signs the two component terms of the above conditions can take. To see this, suppose, the utility in the current period is simply the combined revenue earned selling on contract and sidesale to another buyer. Assuming that this is net of any anticipated penalty for default. The penalty is cast as a negative function of

[8]The assumption is that the costs and subjective beliefs that the firm hold about the reliability of the other farmers during time $t + 1$ are constant.

compliance, so that as compliance increases, the expected penalties are lower. These penalties can be both literal in the sense of damages that farmers have to pay through public enforcement as well as monetized representation of costs associated with guilt, loss of reputation, etc.

The utility in the current period is denoted by the price obtained for sale of a proportion (θ_{it}) commodity to the contracting firm (P_{ct}) plus the returns earned from diverting a part of the contract commodity ($1-\theta_{it}$) to the spot market or an alternate market at price P_{mt}, both of which are now known. Assume that there are no transactions costs, for illustrative purposes. Further, assuming that the anticipated penalty or cost incurred by virtue of defaulting is an increasing function of the proportion diverted, so that we have $\kappa(\theta_{it})$ with a negative first derivative, and 0 when the farmer complies fully, we can write out the current utility is

$$U(\theta) = [(P_{ct} - P_{mt})\theta_{it} + P_{mt}]\bar{q}_t - \kappa(\theta_{it}) \tag{4.18}$$

Denoting the proportionate price differential between the contract price and spot market or price in the alternate market as $D_{it} = \frac{P_{ct}-P_{mt}}{P_{ct}}$ and rescaling to adjust for level of price, it is possible to rewrite Equation 4.18

$$U(\theta) = D_{it}\theta_{it}\bar{q}_t - \kappa(\theta_{it})$$

Using this, the first order conditions for full or partial compliance, Equation 4.16 can be rewritten as

$$D_{it}\bar{q}_t - \kappa'(\theta_{it}) + \beta E_t \frac{\partial V_{t+1}(\theta_{i,t+1})}{\partial \theta_{i,t+1}} \frac{\partial \theta_{i,t+1}}{\partial \theta_{it}} > 0 \tag{4.19}$$

There are specific cases that are interesting in the context of this study. Other cases do not hold as much interpretive appeal and are hence not discussed.

It goes without saying that as long as D_{it} is positive, i.e., the spot market price reigns lower than the contract price, and if the present value of continued relationship is also positive, the above condition would hold. In this case, there is a positive reinforcement of price-related incentives and

relationship-based incentives. Supposing $D_{it} > 0$, given a positive price differential, the higher the value of future relationship, the greater the possibility of this condition being met. So too, given the value of a relationship, the higher the price differential more likely that the condition is met.

Consider, however, the case where the spot market or alternate price is much higher than the contract price. This is often the most powerful incentive for breach by contract farmers. This implies that $D_{it} < 0$. Are there instances when the farmer would comply with the contract even when he or she is likely to increase profits by diverting contracted produce to the spot market? It is easy to see that in a one-shot interaction, the present value of expected future relationship is 0. In this case, without penalties, the farmer would certainly have an incentive to pick $\theta_{it}^{*} = 0$ However, if there are penalties, then the farmer would only divert such a proportion that would equate the marginal gain from side-selling to the marginal cost of penalties for doing so. The interesting case however is when the farmer associates a positive value to a continued relationship. In this situation, even if there were no penalties for breach, as the condition above illustrates, as long as the current value of expected future relationship is positive and higher in absolute value that $D_{it}\bar{q}_t$, this is consistent with the farmer complying with the contract. In the additional presence of penalties for non-compliance, is enough that the following condition holds.

$$-D_{it}\bar{q}_t \leq \beta E_t \frac{\partial V_{t+1}(\theta_{i,t+1})}{\partial \theta_{i,t+1}} \frac{\partial \theta_{i,t+1}}{\partial \theta_{it}} - \kappa'(\theta_{it}) \tag{4.20}$$

The first order condition that is consistent with partial or full compliance could hold if the present value of future relationship is positive and large enough to match the negative returns in time period t. With full compliance, the above equation holds with strict inequality so that the farmer is better off foregoing the return to diverting even a small proportion to sidesale, given the combination of penalties and the value of continued relationship with the firm. Thus, farmers might be willing to tolerate a loss in the current period and comply with the contract if they perceive adequately large benefits from continued relationship with the firm. This is akin to the Folk theorem result and in many empirical contexts, it captures the value of social relations and inter-temporality of relationships in supporting transactions.

When $D_{it} < 0$, assuming that there is no penalty on default, if the relationship with the firm

is not valued enough, it could lead the firm to breach fully, and the farmer ends up selling nothing to the firm.

This model allows defining a latent variable $\tilde{y_i}$ such that

$$\tilde{y_i} = D_{it}\bar{q_t} - \kappa'(\theta_{it}) + \beta E_t \frac{\partial V_{t+1}(\theta_{i,t+1})}{\partial \theta_{i,t+1}} \frac{\partial \theta_{i,t+1}}{\partial \theta_{it}} \tag{4.21}$$

If $P(H)_i$ denotes the probability of a farmer i honoring the contract in full (=1) or not (=0),

$$P(H)_i \quad = \quad \begin{cases} 1 & \text{iff } \tilde{y_i} > 0, \\ 0 & \text{iff } \tilde{y_i} \leq 0 \end{cases} \tag{4.22}$$

This provides the foundation for the empirical model estimated in Chapter 11, to test if a higher price differential is associated with a higher probability of self-declared full compliance, if the prospect of punishment acts as a deterrent and if the potential for future relationship has a positive association with probability of self-declared full compliance.

4.2.2 Firm's decision to honor

A contracting firm's decision to honor the contract involves determining the proportion of contracted produce, α^*_{it}, a firm evacuates from each contracting farmer i's field after harvest. The firm's optimal vector of proportions that it will evacuate over the domain is the value that maximizes the current benefits from evacuating a contract farmers's produce combined with value of future benefits, summed over all the contract farmers.

Assuming that $\bar{q_{it}}$ is a farmer's output and that this is common knowledge and $\alpha_{it} \in [0, 1]$ denotes the proportion the firm can evacuate from i's farm, paying contract price P_c per unit. Let the price of the downstream at which the firm sells this produce be P_{rt}. In addition, there are transactions cost of evacuation, mainly costs of transport, but also of weighing, quality checking, loading, etc. These transactions costs depend both on the volume evacuated from each farmer, which can be written as $t(\alpha_i \bar{q}_{it})$ and is increasing in the volume evacuated. There is another cost component that firms typically factor in, and this has to do with the extent of procurement

represented by the number of farmers. While in this model it is treated as a headcount, it can be interpreted as a proxy capturing a spatial aspect, wherein more farmers covered represent covering a larger area or more villages. This is denoted by the function $h(n(\alpha_{1t}\bar{q}_{1t}, \ldots \alpha_{Nt}\bar{q}_{Nt}))$. This an appropriate way of thinking about firms' evacuation decisions, given that firms bear the cost of sending out their vehicles to pick up produce over large areas and a large number of farmers.

Further, assume that the present value of expected benefit to the firm of a continued relationship with the farmers is represented by $\beta E_t V_t \left[\alpha_{1t+1}(\alpha_{1t}), \ldots, \alpha_{Nt+1}(\alpha_{Nt})\right]$. This is a simple relation that suggests that the value of continued future relationship is a function of the firm's current contractual performance. From the farmer's contracting problem presented earlier, it was suggested that farmers hold beliefs about the reliability of the firm denoted by the parameter α. Here, $\alpha_{it+1}(\alpha_{it})$ suggests that farmer i's perception of the firm's reliability when the former makes a contracting decision in period $t+1$ is a function of the firm's current contractual performance α_{it}, assuming in particular that it is an increasing function, so that the greater the proportion of contracted produce evacuated from farmer i, farmer i would likely view the firm as being more reliable in the context of making future contracting decisions. In other words, the assumption is that farmers use the firm's optimal choice, α^*_{it}, is used to update their beliefs about the reliability of the firm α_{it+1} in the next time period, in turn influencing their optimal contract acreage allocation. The value of future relationship with a farmer i is therefore a function of the proportion the firm chooses to evacuate from each farmer at time period t.

The firm faces an additional constraint on capacity, so that the total procurement $\sum \alpha_i \bar{q}_{it}$ should fall between $\underline{Q}$ and $\bar{Q}$, the former denotes the minimum capacity to run a processing plant, for instance, and the latter denoting the maximum capacity.

The firm's problem is to maximize expected profits from evacuation of produce, and is equivalent to maximizing expected return net of procurement costs and the present value of continued relationship with the farmer(s).

$$\underset{\alpha_{it}\in[0,1]}{\text{Max}} \left[\sum_{1}^{N}(P_r - P_c)\alpha_{it}\bar{q}_{it} - \sum_{1}^{N} t(\alpha_i\bar{q}_i) - h(n(\alpha_{1t}\bar{q}_{1t}, \ldots \alpha_{Nt}\bar{q}_{Nt}))\right] + \beta E_t V_{t+1}\Big[\alpha_{1t+1}(\alpha_{1t}), \ldots, \alpha_{Nt+1}(\alpha_{Nt})\Big]$$

$$\text{subject to } \sum_{1}^{N} \alpha_i \bar{q}_{it} \in [\underline{Q}, \bar{Q}]$$

The firm chooses a vector $\{\alpha_{it}^*\}_{i=1}^N$ such that it solves the problem above.

For an interior solution, so that the total procurement is in the interior of the capacity constraint and proportion of evacuated produce lies between 0 and 1 for each farmer i, the set of first order conditions, i.e., for each i is given by

$$\left[-P_r + P_c + t'(\alpha_{it}\bar{q}_{it}) + \overbrace{\frac{\partial h}{\partial n}\frac{\partial n}{\partial \alpha_{it}\bar{q}_{it}}}^{(-)}\right]\bar{q}_{it} = \beta E_t \frac{\partial V_{t+1}}{\partial \alpha_{it}} \tag{4.23}$$

Whenever at the optimum the firm chooses to evacuate at least some contracted produce, but not all, from any two farmers i and j i.e. $\alpha_{it}, \alpha_{jt} \in (0,1)$, this implies that

$$\frac{\beta E_t \frac{\partial V_{t+1}}{\partial \alpha_{it}}}{\left[-P_r + P_c + t'(\alpha_{it}\bar{q}_{it}) + \frac{\partial h}{\partial n}\frac{\partial n}{\partial \alpha_{it}\bar{q}_{it}}\right]\bar{q}_{it}} = \frac{\beta E_t \frac{\partial V_{t+1}}{\partial \alpha_{jt}}}{\left[-P_r + P_c + t'(\alpha_{jt}\bar{q}_{jt}) + \frac{\partial h}{\partial n}\frac{\partial n}{\partial \alpha_{jt}\bar{q}_{jt}}\right]\bar{q}_{jt}} \tag{4.24}$$

In essence, this implies that the firm chooses to evacuate volumes from contracted farmers such that the ratio of the marginal costs of doing so are equated to the ratio of the expected marginal value of future relationship with each of them from doing so.

If this set of conditions represents the optimum, it must also satisfy the capacity constraint, that the firm never procures more than $\bar{Q}$ and never less than $\underline{Q}$.This essentially implies that for any produce the firm procures beyond capacity and cannot process, the downstream returns are nil, and the firm bears a cost without corresponding returns. The case where the firm procures nothing from anyone is ruled out by the Capacity Constraint in this model, although it can renege fully on the contract for some farmers while evacuating produce from some others.

If, at the optimum, a firm chooses not to evacuate volumes from, say, farmer i but does collect produce from farmer j, i.e., $\alpha_i = 0$ and $\alpha_j > 0$, it must be the case that

$$\frac{\beta E_t \frac{\partial V_{t+1}}{\partial \alpha_{it}}}{\left[-P_r + P_c + t'(\alpha_{it}\bar{q}_{it}) + \frac{\partial h}{\partial n}\frac{\partial n}{\partial \alpha_{it}\bar{q}_{it}}\right]\bar{q}_{it}} < \frac{\beta E_t \frac{\partial V_{t+1}}{\partial \alpha_{jt}}}{\left[-P_r + P_c + t'(\alpha_{jt}\bar{q}_{jt}) + \frac{\partial h}{\partial n}\frac{\partial n}{\partial \alpha_{jt}\bar{q}_{jt}}\right]\bar{q}_{jt}} \tag{4.25}$$

This simple condition suggests many relationships that have empirical relevance. With respect to

large farmers, i.e., when individual farmers produce a large quantity, a marginal increase in the proportion of produce procured from such a farmer is consistent with the firm procuring from fewer farmers leading to a savings in cost. So, $\bar{q}_i$ could be an important factor. However if the firm perceives that reducing the proportion procured from other farmers in the process is associated with a lower expected value of continued relationship with those farmers, the firm would choose not to do so. This need to maintain balance between current benefits and the value of future relationships is fairly typical of firms' decisions to honor the contract with farmers.

It is important to note that the firm will undertake full compliance and evacuate the entire harvest from every contract farmer if and only if $\sum \bar{q_{it}} \leq \bar{Q}$. If this is not the case, the firm necessarily does not comply fully and there exist at least some α_is that are strictly less than 1, implying that there must exist some i for whom,

$$\left[-P_r + P_c + t'(\alpha_{it}\bar{q}_{it}) + \frac{\partial h}{\partial n}\frac{\partial n}{\partial \alpha_{it}\bar{q}_{it}}\right]\bar{q}_{it} > \beta E_t \frac{\partial V_{t+1}}{\partial \alpha_{it}} \tag{4.26}$$

In this formulation, the possibility of firms accepting produce in order to preserve the value of future relationships is ruled out because of the capacity constraint. However, if this capacity constraint did not exist, and the firms could procure as much as they want, than it could well be the case that the firm takes on losses to preserve the value of future relationships, just as was the corresponding case in the farmer's honoring decision problem.

This way of modeling a firm's contractual performance can be developed further to illustrate a number of other possibilities, which are beyond the scope of this work. This section is merely a first step towards such formalization.

4.2.3 Contractual performance over the domain

If the firm and farmers optimize their contractual performance decisions, the equilibrium quantities exchanged as part of the contracting arrangements is now defined by

$$Min\left\{\theta^*_{it}, \alpha^*_{it}\right\}\bar{q}_i \forall i \in n \subseteq N \tag{4.27}$$

Whenever for any farmer i, $\theta^*_{it} > \alpha^*_{it}$, this implies that the firm is evacuating less than the farmer is willing to deliver to the firm. On the other hand, when $\theta^*_{it} < \alpha^*_{it}$ then the farmers are delivering less, whereas the firm is prepared to evacuate larger volumes from the farmer. When they are exactly equal to each other, this implies absence of rationing out from either side, and hence the farmers and the firm exchange volumes that are mutually optimal.

4.3 Updating beliefs

Whenever there is some friction in the honoring of contractual commitments so that $\theta^*_{it} \neq \alpha^*_{it}$, it indicates one partner in the contractual relationship does not achieve the optimum. This prompts agents to reassess the beliefs under which they made the contracting decisions, updating their beliefs using the revealed contractual performance from the honoring stage.

$$\theta_{it+1} = f(\theta^*_{it}, \theta_{it}) \tag{4.28}$$

$$\alpha_{it+1} = f(\alpha^*_{it}, \alpha_{it}) \tag{4.29}$$

This is used as the basis for contracting decisions at time $t + 1$. The evolution of beliefs is key to understanding the trajectory of contract farming arrangements over their life cycle, while exogenous shocks operate on the variables that are assumed to be determined by nature.

The framework presented above thus takes the entire contracting domain as a unit of analysis and allows for heterogeneity across agents. Further, it suggests that at each stage the mutual perceptions of reliability form the basis of decisions, along with the uncertainties associated with stochastic outcomes in the future. The structure allows for agents to update their beliefs based on observed action of contracting partners, suggesting an underlying dynamic and possibilities for evolution.

Part II

Empirical Work

In Part I, this thesis developed a case for treating the 'domain' of a contract farming scheme as the relevant unit of analysis rather than the contract or an individual farmer. Further, implicit in the notion that contract farming systems are frictional equilibria is that enduring transactional relationships between a farmer and a contracting firm are far more textured by mutual perceptions of risks and the costs of transacting than is usually acknowledged. This, in turn, guides selection of farmers by firms and the farmer's willingness to contract with the firm. The conceptual framework underpinning this study also suggested that the microanalytics of contract farming arrangements represents but one level of institutions, amenable to neoclassical and transactions costs analysis. This is couched in a larger scale institutional environment that embodies formal rules and legal frameworks, for which a different mode of analysis might be more appropriate.

Part II of this study shifts focus to take up an empirical analysis of the farm-firm interface of five contract farming schemes in the southern Indian state of Tamil Nadu, for gherkins, cotton, marigold, papaya and broiler. Following the theoretical framework, presented in Chapters 3 and 4, that treats institutions as a layered concept, the empirical analysis traverses these different scales of resolution: first, examining the macro institutional environment and the formal rules of the game that have enabled the emergence of contract farming on a large scale in India and in Tamil Nadu before zooming in to get a higher resolution view of the contract farming schemes themselves. The particular goal of this empirical exercise is to use the theoretical lens elaborated in Part I to investigate select aspects of contract farming practice: farmer perceptions of the risks and associated with contracting, selection of and churning in a contracting firm's portfolio of farmers, sources of gains to contracting and the nature of contract enforcement mechanisms. These are interconnected elements of the theoretical viewpoint presented earlier, but each of them is also

of significant individual importance. The empirical analysis thus traces the contours of contract farming practice in India as an institutional phenomenon at different levels.

Chapter 5 offers a descriptive analysis of the institutional environment, the first level of institutions, where first-order economizing is relevant (Williamson, 1991). It outlines forces that have shaped the broader institutional environment for agribusiness in India. Chapter 6 then lays out the empirical setting for the survey, introducing the study area, crop sectors and the firms selected for the study. Chapters 5 and 6 serve as a prelude to empirical analysis and flag themes that recur in subsequent discussions. Following Chapter 6, four chapters address, in turn, each of the core selected aspects of contract farming practice. Chapter 7 elaborates on the the farmers' subjective perceptions of and tradeoffs between risks and gains associated with contracting and its association with contracting status. Chapter 8 deals with who participates. It investigates farmer selection by the firm and exclusion of different types. Chapter 9 assesses welfare gains from contract participation, assessing treatment effects on both participants and non-participants. Chapter 10 takes a closer look at enforcement issues in the firm-farm relationship, as mediated through a contract or some notion of it. Chapter 11 serves as an epilogue documenting the intertemporal variation in the portfolio of farmers the firm procures from. These empirical aspects address in detail the other levels of institutions examining the play of the game and the performance, or second and third-order economizing. Together, these constitute Part II of this thesis.

Chapter 5

Contract Farming in India: A Contemporary History

In recent years, Indian agriculture has been popularly characterized as being in a 'crisis', lagging behind other sectors in an era of rapid economic growth.[1] Indian agriculture today faces a perplexing array of issues. Despite the declining contribution of agriculture to Gross Domestic Product (GDP), constituting 17.8% in 2007-08, it is still the source of livelihood for 52% of the total workforce (Government of India, 2009). Farming continues to be dominated by smallholder, rainfed agriculture, often for subsistence, with farms getting smaller. In 2001, the average size of a farm was only 1.33 hectares. An overwhelming majority are small and marginal farmers; in 2001, 81.3% of the operational holdings were less than two hectares (Government of India, 2008). Persistent low yields, environmental stress and gradual erosion of the natural resource base present grave difficulties for the farmer. Only a fraction of the farmers use modern agriculture practices and many who do, often pursue unsustainable practices. Further impediments exist in the form of infrastructural and institutional constraints with regard to input supply, credit, post-harvest management and marketing, raising transactions costs significantly for small farmers. Together, these undermine the ability of a large section of farmers to earn a decent livelihood.

Yet, at the same time, there is immense potential for the agricultural sector to reinvent itself against a backdrop of a rapid structural shift in the economy that has contributed to growing urban and middle-class incomes. Indications are that such a reconfiguration of institutions within the agricultural sector has already begun. Contract farming is often seen as an important constituent element in this transition (Government of India, 2009, 2000).

To understand the ingredients of this transformation and the place of contract farming practice

[1]For a detailed discussion, see Expert Group on Agricultural Indebtedness (2007).The compound growth rate of the agricultural GDP during the Ninth Plan (1997-2002) and Tenth Plan (2002-07) was 2% and 2.1% respectively compared with an overall GDP growth rate of 5.5% and 7.6% respectively (Government of India, 2008)

in this larger institutional context, it is useful to step back to look at the recent history of agricultural policy in India.[2]

5.1 Contract Farming in India: History and Policy

Ever since Independence in 1947, transactions in farm commodities have been regulated heavily, notably through the Essential Commodities Act (ECA) and the Agricultural Produce Marketing Committees Act (APMC Act). The ECA imposes restrictions on storage and movement of certain "essential" commodities by private parties, mainly to protect consumers. The APMC Act, on the other hand, mandated that purchases of certain agricultural commodities be through government regulated markets (*mandis*) with the payment of designated commissions and marketing fees. Furthermore, the Land Ceiling Act proscribed firms from owning and operating large-scale factory-farms. Together, these severely circumscribed private sector participation in agriculture.

Though the APMC Act was designed to protect farmers' interests, it perversely rendered farmers dependent on middlemen,who were financiers, information brokers and traders, all rolled into one. This dependency often turned exploitative; farmers received but a fraction of the price paid by the final consumer, with middlemen cornering a large part of the rest. Over time, critics felt that APMC Act and the ECA had perhaps overextended their reach, compromising farmers and consumers in favor of trader-middlemen.

Since 1991, with economy-wide reforms, three broad trends began to put severe pressure on these policies that were perceived to be anachronistic, inefficient and iniquitous. First, with the growth of private sector participation and export orientation in processing industries following delicensing, control over the source of feedstock to ensure quality and traceability became desirable. Given the restrictions on ownership of lands and weak titling of land that makes land lease arrangements difficult, agribusinesses have sought reform of laws to permit contract farming as a means of procurement. In particular, they have sought legal frameworks that enable what in business jargon is referred to as "disintermediation" in agricultural transactions, i.e., removing the long chain of intermediaries.

[2]This part draws on Narayanan (2010a).

Second, growing middle and upper class incomes especially in urban India have been a source of a new kind of demand. Changes in the consumption basket reflecting both a westernization of diets (Pingali, 2007; Pingali and Khwaja, 2004) and the dietary transition from foodgrains to higher value commodities such as meats, dairy, fruits and vegetables, and more processed forms of basic foods, exert a novel influence on cropping patterns. For instance, per capita monthly consumption of cereals has come down from 14.9 kg. in 1983 to 12.2 kg. in 2004-05 in rural areas, while urban areas have witnessed a decline from 11.6 kg. to 9.9 kg. during the same period (National Sample Survey Organization, 2006).

At the same time, a greater regard for food safety and quality with the emergence of supermarkets and modern retail chains has necessitated a steady supply of fresh produce of consistently good quality (Gulati, 2007). The organized Indian food and grocery retail market is expanding at an annual rate of 16 to 50 % and the top ten organized food and grocery retailers in India grew at an average annual rate of about 72% during 2002-07 (Gulati et al., 2008; Reardon et al.; Gulati, 2007). Thus, from a largely supply-driven or 'farm-to-fork', rice-wheat based system, Indian agriculture is transitioning rapidly to a more diverse, demand-driven or 'plate to plough' system (Joshi and Gulati, 2003). This transition challenges traditional modes of transactions and preexisting institutions, especially in the case of high-value perishables that require strong backward linkages with farms.[3]

Third, against a background of a silent collapse of state extension systems and rising input subsidies to agriculture, the state began to disengage from traditional forms of policy intervention seeking to create spaces for the private sector within agriculture. Contract farming began to feature prominently in this effort. In 2000, as part of what was termed a "Rainbow Revolution", the National Agricultural Policy stated: "private sector participation will be promoted through contract farming and land leasing arrangements to allow accelerated technology transfer, capital inflow, and assured market for crop production". Soon after, in 2003, a Model Act (The State Agricultural Produce Marketing Development and Regulation Act) outlined a framework for contract farming

[3]Gulati et al. (2008) point out that given rising incomes and higher expenditure elasticity for these commodities, future growth is likely to come from the high value sector. Although more than 60% of gross cropped area is under cereals and pulses; their share of the value of total agricultural output is now less than 25% (Triennium Ending (T.E.) 2006-07). The share of high value commodities, including horticulture, livestock, and fisheries, in the total value of agricultural output has already increased from 37.2% in T.E. 1982-83 to 47.5% in T.E. 2006-07.

operations that would safeguard the interests of both firms and farmers equitably. It also paved the way for private market yards, direct buying and selling, among other things. This was later complemented by the creation of Agri-Export Zones (AEZ) across the country, where firms involved in agroprocessing for exports would benefit from tax breaks and specific infrastructural facilities. Contract farming in high value crops also became part of a larger strategy for diversification, weaning farmers away from the rice-wheat system that so dominated Indian agriculture.

The emergence of contract farming and the debates surrounding it is best understood within this broader and evolving institutional context.

5.2 Extent and Spread

In India, agriculture is a state subject so that substantive policy levers in the country work within individual states. Some states, like Tamil Nadu, had always permitted contract farming. Others were already providing space for such arrangements in select sectors such as horticulture. It was however Punjab that led the way, when it permitted PepsiCo take up tomato contracting for its processing plant 1989. Soon after, contracting in high value commodities, such as basmati, spices, chillies, flowers and fruits began in many states. By the late 1990s, the basket of contract crops already included "exotic" commodities like baby corn, cut flowers, etc. Several states followed suit. According to the Economic Survey of 2009, barring a few states, most have reformed the APMC Act, albeit to different degrees. Some states have however desisted from deep reform.[4] For example, in 2008 Metro Cash and Carry's APMC license was renewed in West Bengal only under condition that it would not pursue contract farming.

While the precise implications of these reforms for private marketing remains unclear, overall, it has provided firms a broader space for operations than ever before. Contract farming schemes now embrace a wider range of crops and new geographies.

The true extent of contract farming in India is largely unknown since there is no formal recording system. It is clear however that a rich mosaic of corporate, civil society and state actors have entered

[4]For a status of reforms see Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India at http://agricoop.nic.inPolicyIncentivesprogress.pdf, accessed November, 2008.

the fray, across the country (though less in the east and north-east), seeking to source produce for processing and retail. With state effort to promote private sector participation in agriculture and an eager private sector eyeing the "fortune at the bottom of the pyramid" (Prahalad, 2009), contract farming schemes have mushroomed since the mid-1990s. These arrangements, like elsewhere in the world, are polymorphic, differing greatly in the nature of actors, relationship intensity, and degree of formality, specific terms and scale of operation. Some contract with as few as fifty farmers, others contract with so many farmers that they contract with agents or intermediaries, who then contract with farmers. The development of contract farming in India is still in flux. Mortality of contract schemes is high but rarely recorded and it is unclear how many initiatives survive beyond a few seasons.

In general, it is apparent that contract farming has endured best in high-value, niche commodities, especially for the export market, and where a well-functioning, competing, domestic market does not exist. Gherkins offer the best example. Introduced into peninsular India in the early 1990s by pickling plants in the region, gherkins are almost entirely sourced through contracts. By the triennium ending (T.E.) 2008, India accounted for as much as 15% of the world's exports of pickled gherkins. Similarly, large swathes of land, especially in Karnataka, are now under high-value medicinal plants and herbs, ashwagandha, aloe vera, coleus, stevia and so on, for nutraceutical firms. Certified organic supply chains have emerged too for which a whole range of spices and horticultural produce are now contracted (e.g., in Uttaranchal).[5]

Contract farming has found least traction when it emerges against a strong alternate domestic market or when too many partners hold the arrangement together. Many rice and wheat contract farming efforts by private sector banks and firms folded up after initial experiments. Cotton contract farming, in states such as Tamil Nadu, are fast fading into Corporate Social Responsibility initiatives. In other instances, state-supported schemes for jatropha and oil palm did not take off. In many of these cases, production risks were high and disagreements over pricing led to disgruntled farmers shifting out of the crop.

Despite some commonalities, the relative success of a scheme depends ultimately on the

[5] As far as possible figures are presented for triennia or an average for three years. This is typical for agricultural commodities, where annual fluctuations are large enough that the figure for a particular year could be misleading.

particular relationship between firm and the farmers and factors in the external environment. There are numerous examples of successful schemes that have stabilized and are now over a decade old, despite having competing markets and competitors,wheat and soy contracts for flour making in Madhya Pradesh and Uttar Pradesh, sunflower and safflower for oil in western and central India, marigold and papaya for extracts in Karnataka and Tamil Nadu.

The broiler industry in the states of Andhra Pradesh, Maharashtra and Tamil Nadu is today almost entirely integrated through contract farming, led by Godrej Agrovet, Suguna, and Ventakeshwara Hatcheries. In fact, the industry's embrace of contract farming virtually rescued the poultry sector in Tamil Nadu, at a time when price volatility and poultry disease had dismantled the livelihoods of small poultry farmers. More recently, a few firms have successfully acted as back-end integrators for retailers based in Europe and the United States of America, contracting for fresh produce in north-western India.

Apart from retailers and processors, many contract farming schemes have been initiated by input manufacturers, especially of fertilizers and pesticides (e.g., Rallis), along with partners who take responsibility for buy-back. Banks, like ICICI and the State Bank of India, have partnered contracting firms in multi-partite arrangements to provide crop loans and working capital, with the contract itself as collateral. Some state governments too have been proactive, engaging hands-on in tri-partite contract farming ventures with agribusinesses and banks, acting sometimes as guarantors, sometimes as relationship-managers. For example, the Punjab Agro-Industries Corporation founded in 1996 has partnered a number of agribusinesses in implementing projects. Tamil Nadu adopted a public-private tripartite model for cotton contract farming in 2004-05. Karnataka actively promoted gherkins and grape clusters in the state with great success. States such as Andhra Pradesh and Mizoram have attempted to replicate the sugarcane model for oil palm contract farming, mandating farmers to supply fresh fruit bunches to privately owned mills at administered prices.

Non-governmental organizations have been involved as well, mediating contractual relationships between groups of small farmers and agribusinesses as with BASIX (for chipping potato contracts with Frito Lays India Ltd. in Jharkhand) and PRADAN (also in Jharkhand). Sometimes

contracting is just one element of a broader and deeper relationship with the farmer. This model, now called "open-source intermediation" involves establishing rural business hubs, where a multiplicity of farmers' needs is addressed under a single roof. ITC's Choupal Fresh and DCM Shriram's Hariyali Kisan Bazaar are two such ventures, which offer to buy back produce from farmers without obligations to do so.

As is evident from this account, the past two decades have seen the beginnings of a potentially dramatic change in the institutional landscape of Indian agriculture and could well signify a watershed. A combination of pressures endogenous to the system (for instance, changing diets and growing incomes) and exogenous efforts to alter the legal and institutional setting for agrarian markets and trade have contributed to establishing, at the macro and meso levels, an environment conducive to the emergence of contract farming on an unprecedented scale.

5.3 The Debates on Contract Farming

Opinions on the normative implications of this new dynamic represented by emerging, modern supply chains, both in terms of welfare consequences of individual smallholders and changes at the community level, continue to be divided. In particular, the wisdom of a retreating state in the context of pervasive resource-constrained smallholder agriculture and the reliance on private sector-driven growth has been called into serious question.

On the one hand, a majority of studies on income gains from contracting in India suggest that contract farmers earn substantially higher profits than non-contract farmers (anywhere between 1.2 to 4 times depending on the commodity and scheme).[6] These gains come partly from savings in transactions costs (estimated at 60-90% for dairy, vegetables and poultry) and sometimes through productivity gains. Often contracting firms introduce new methods of cultivation or technologies (drip irrigation, new cultivars, etc.) which reduce unit production costs contributing to improved relative profit efficiency. There is some documented evidence of this for livestock and tomato contract farmers. Contract farming is also known to reduce certain risks. In poultry contracting,

[6]Singh (2007) and Gulati et al. (2008) review studies of contract farming in India. These studies are discussed in greater detail in Chapter 9 and are not elaborated on here.

for instance, farmers transferred 88% of production and marketing risks to the firm, implying that contracting reduces the volatility growers would have faced if they had produced for alternate markets (Birthal et al., 2005).

On the other hand, despite these observed benefits, contract farming often brings other attendant risks. A main problem stems from enforcement issues. It is often difficult to tell apart firms with a genuine business proposition from fly by night operators who seek to exploit loopholes in laws to landgrab. For both the farmer and the firm, owing to weak public enforcement mechanisms, it is difficult to redress loss owing to contract breach by the other party. The farmer, however is typically less able to seek redressal when the firm breaches its contract. Equally importantly, the difficulty in scaling up and sustaining contractual farming arrangements in India casts a deep shadow of doubt on the potential of contract farming to serve as an instrument for rural poverty alleviation. In India, as elsewhere, contract farming schemes have been fragile. Only a fraction of contract farming initiatives have survived beyond a few years. The geography of contract farming in India suggests too that schemes are concentrated spatially, dense in some areas and quite sparse in others, even within areas with comparable agro-ecological attributes. To what extent does this reflect a spatial diffusion process which will eventually envelope more regions and to what extent does it reflect systematic firm preferences for particular geographies, with less favored areas destined for exclusion, representing geographic poverty traps? As Gulati et al. (2008) point out, so far, not much attention has been given to measures of risk mitigation against production and price failures, which are important for sustainability and scalability of contracting ventures.

These particular sets of concerns regarding the implications of contract farming practice in India correspond closely to the theoretical and empirical concerns raised in Part 1 of this study, making India an eminently appropriate site for studying contract farming from the CIA viewpoint. At the same time, viewing these concerns through the CIA lens might generate empirical evidence and insights into these debates in a way that can inform policy.

Chapter 6

The Empirical Setting: Introducing the Survey Area and the Crops

The empirical exercise for this thesis focuses on the southern Indian state of Tamil Nadu, mainly for its comparatively long history of contract farming and the presence of contracting in multiple crops in a fairly small region. The study area offers diversity in geographic and socioeconomic characteristics, so that in studying contract farming across multiple commodities in this region, it is possible to reach for something beyond a case study and understand both the commonality and heterogeneity of contract farming practice.

Tamil Nadu, located in the south-eastern corner of peninsular India, is among the more forward and industrialized states in India, faring better than the All-India average across a broad range of indicators. While it is ranked fifth among the states of India in terms of per capita income,[1] its Human Development Index puts it in the third spot (0.531 versus All-India figure of 0.472 in 2001).[2]

A distinguishing feature of Tamil Nadu is its relatively high degree of urbanization. Around 44% of the population, according to Census 2001, reside in urban centres, relative to 27.8% All-India Table 6.1. This is despite its importance as an agricultural state, contributing around 5% of India's agricultural Gross Domestic Product (GDP). Tamil Nadu possesses too approximately 6% of India's population and 4.5% of its arable land (Government of India, 2008).[3]

Its reputation as a progressive state in the arena of social development and its pockets of industrial strength have, however, not prevented an ongoing struggle to maintain economic growth

[1] According to the Economic Survey Government of India (2009), the per capita State Domestic Product at current prices for Tamil Nadu is Rs. 38573 per capita per annum, against the country average of Rs.33283 in 2007-08.

[2] See Government of India (2007b),Table 1.6, http://socialjustice.nic.in/pdf/tab16.pdf, accessed January 2010.

[3] The population figure pertains to census 2001 and the arable land is for 2007-08. Given that the birth rate in Tamil Nadu is among the lowest in India, its share in total population is likely to be lower than the figure cited here. In general, it is difficult to find estimates for the same years, given that timing of the surveys.

and reduce the incidence of poverty, which stood at 22.5% overall in 2004-05, in rural and urban areas alike.

In many respects, the 1990s have been something of a rough ride for the agricultural sector. The Net Sown Area as proportion of all cultivable land has shrunk from 68.34% in 1990-91 to just 58.5% in Triennium Ending (T.E.) 2002-03 before recovering to 63.09% in T.E. 2007-08. The cropping intensity has declined from 1.19 to 1.16 before settling at 1.15 during the above spans of time.[4] This suggests that the last decade has seen a shrinking of the extent of use of cultivable land but also that the proportion of land that is cultivated more than once has declined. In the latter part of 1990s, 1995-96 to 1999-2000, the rate of growth of agriculture declined sharply to 1.23 per cent annually, while that of industry and services sector increased considerably and stood at 4.97 per cent and 10.20 per cent, respectively.

The share of agriculture declined from 24.57% of the State Gross Domestic Product (GDP) in the 1980s to 21.85% in 1990s before declining to only 11% in T.E. 2008-09. While this is often associated with a maturing economy, in the case of Tamil Nadu, the proportion of the workforce in the agricultural sector has not declined at a similar pace, leaving about half the workforce still dependent directly or indirectly on agriculture. Productivity in agriculture seems to be levelling off, speculation in real estate by urban investors is bidding land away from agriculture, and often left fallow. Coupled with the falling groundwater table in the early 2000s, failed monsoons and the uncertainty associated with disputes over the shared Cauvery river waters,these have collectively rendered agriculture a distinctly unattractive proposition. Agricultural labor too appears to find newer avenues of employment with the small-scale and informal sectors in urban areas and the consequent bidding up of wages has posed a problem for cultivators hiring farmhands. Holdings have gotten smaller over time and the proportion of smallholders among all cultivators has increased consistently over the decades since Independence. In 1995-96, 90% of the landholding was less than two hectares (75% were less than a hectare); small and marginal farmers accounted for 54% land cultivated. By 2005-06, 91.3% of landholdings was less than two hectares and accounted for 58.72% of cultivated land Government of India (2009).

[4]Cropping intensity is the average number of times per year a unit Net Sown Area is utilized.

Against this background, the Government of Tamil Nadu has tried, in the past decade, to evolve ways to enable agriculture to recover and cope. For instance, the Government of Tamil Nadu has been pushing for a shift to less water-intensive high-value crops (floriculture and horticulture) apart from experiments with precision farming and organic agriculture.

While the entire menu of policies is not relevant to this analysis, it is worth noting that in the years starting in 2002, there is an explicit and officially stated objective of promoting contract farming across a range of crops, in different ways: cotton, through the private sector spinning mills backed by a state-owned enterprise (known now as a "Tripartite Model"), maize and oilseeds, exclusively through state-owned National Agricultural Cooperative Marketing Federation of India, Limited (NAFED), oil palm, through designated ('licensed') private sector firms, and later on, in 2005, jatropha and sweet sorghum along similar lines. While some are linked to the Central Government's interventions in particular crop sub-sectors, others like maize and cotton are, by and large, initiatives at the state level. Among other things, providing an institutional space for agribusinesses within crop sectors was expected to contribute to ensuring better returns for and 'de-risking' the farmer. These trends in Tamil Nadu's agriculture and state policy form the backdrop of contract farming practice in the study area.

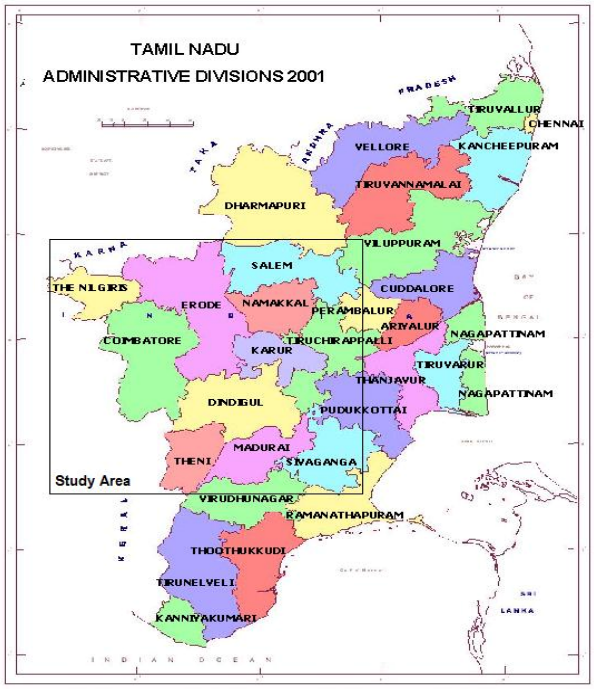
6.1 The Study Area

The geographical area of this study includes eight of the thirty two administrative districts of Tamil Nadu, namely, Coimbatore, Nilgiris, Salem, Erode, Karur, Dindigul, Tiruppur and Madurai (Figure 6.1).[5]

These contiguous districts lie in the north-western interior of the State, sharing borders with Kerala and Karnataka, and marking a rain-shadow region where the Western Ghats roll out into plains eastward. The domain has heterogeneous geographic or agro-ecological characteristics, straddling three of the five officially designated agro-ecological zones within Tamil Nadu; there

[5]Of these, Tiruppur was formed as recently as in October 2008, merging 13 contiguous blocks that originally belonged to Coimbatore and Erode. This study, however, follows the Census 2001 classification of districts assigning Tiruppur's blocks to its former districts. Since the designation of the new district coincides with the period of field research, this study avoids using the district as a unit of analysis.

Figure 6.1: Study Area



Source: Census Maps, 2001, Governmentof India.

are parts that are mid-elevation as well as lowlands. Being in the rain shadow region, the area does not receive rainfall from the South-west monsoon. Most of the region is dry; Coimbatore district is, for instance, among the driest in the state. Availability of surface irrigation is confined to parts of Erode, Salem and a sliver of Coimbatore, due to the Bhavani Sagar and Stanley reservoirs. In the south, Madurai benefits from riverine systems.

Given the predominance of rainfed conditions, much of the agriculture here is the product of application of arduous human labor on lands difficult to work, with open wells for irrigation or electric pumps that draw on groundwater. Some of these districts have had highly commercialized agricultural sectors for over a century. The region comprising Coimbatore, Tiruppur, Erode and Salem (called Kongunad in Tamil history) has always been known for the entrepreneur-farmer. In the late 1950s, Coimbatore distinguished itself as a forerunner in agricultural modernization in Tamil Nadu, well ahead of the green revolution in the rest of India (Harriss-White, 1996; Heyer,

2001, 2000). None of the other districts selected for the study have been exceptional examples of agrarian enterprise as in Kongunad.

In the 1980s and the 1990s, however, it was the high degree of urbanization and industrialization for which Coimbatore was celebrated (Heyer, 2001). Coimbatore agriculture was based on *thottam* land (land irrigated by large open wells), dry land farming, and livestock. The *kavalai* system, powered by bullocks, was used to lift water until the 1960s when electrified pumpsets took over. The water table which had been falling since the early decades of the 20th century fell much more rapidly after electrification. The level of purchased inputs was very high in the 1960s and the 1970s (Sivanappan and Aiyasamy, 1978; Harriss-White, 1996)). Agriculture remained relatively labor intensive, however, as the degree of mechanisation of field operations remained low. Landholding size declined. In the 1980s, water shortages became acute and there was competition for labor from the industrial economy. This led to a fall in agricultural employment and a fall in the cultivated area (Heyer, 2001).

Industrialization in Coimbatore has been based on medium to small scale enterprises rather than large ones. This is less true of the southern fringe of the study area, which has not seen as significant a shift as its northern neighbors. In the 1980s and the 1990s, throughout the study region, especially in the northern districts, many of the medium scale enterprises closed down, making way for smaller scale enterprises. Small scale industry has been the basis of high rates of growth since the 1980s (Heyer, 2001; Damodaran, 2008).

Indeed, in all of the districts in the study area the decadal growth rate of rural population has been negative, more negative than the average for Tamil Nadu as a whole, signifying rapid urbanization (Table 6.2).[6] On the demand side, the growth of urbanization and the region's proximity to thriving urban centers such as Coimbatore and Bangalore, and its proximity to a net food importing Kerala has meant strong demand-led forces that influence agriculture and cropping patterns in the region. Horticultural crops have made definite inroads here, as have a few non-traditional export crops.

While there is a sense that agriculture is a sunset sector, popularly characterized as being in

[6]This signifies a sectoral shift in the workforce, but the pace is not commensurate with the decline in the relative importance of agriculture.

a 'crisis', it is apparently not stripped of its dynamism. The decades of the 1990s and the 2000s suggest that the sector might be trying to adapt to the demands of a new dynamic. The emergence of commercial agriculture on a significant scale, with hubs of crop complexes tied to agribusiness suggests strongly such a search for adaptation. Salem, for instance, has emerged as a focal point for the seed cotton industry and more recently, along with Namakkal a niche zone for medicinal plants. Dindigul is now home to the gherkins complex that has evolved in the 1990s, and has seen a distinct shift to high value horticulture and floriculture, aided by the establishment of Agriculture Economic Zones that provide infrastructure to agricultural processing firms. Erode has now pioneered organic agriculture within the state. Namakkal is the poultry hub of the region, and is the district in India that has the largest production of eggs and broiler. Coimbatore hosts some of the largest poultry integrators in the country, driving an expansion in maize for its feeder units, a trend of the past decade.

The development of specific sets of crop and livestock complexes with strong links to business enterprises stands out as a feature of agriculture in the decades since the 1990s. It is too early to tell what these imply for the agricultural economy of this region and whether these shifts in cropping pattern and emergence of crop complexes will gain enough traction to sustain over the longer term.

6.2 The Contract Commodities, in India and in Tamil Nadu

The five commodities chosen for study have very different histories in the region, yet share a recent past in terms of their roles in shaping the trajectory of contemporary agriculture. Three of the crops, gherkins, papaya and marigold, were introduced into the area recently, in the early 1990s, while cotton and broiler have long occupied a prominent place in the agrifood system of the region.

Gherkins is a non-traditional export crop with no domestic market. The crop is procured from farmers, and processed at small scale plants, by washing, rinsing and preserving in brine, acetic acid or vinegar. These are either bottled and labeled for international clients or shipped out in barrels for bottling. Cotton is a traditional cash crop in parts of the study area with established local markets and networks. Recent years have seen mills integrating along the garment chain,

Table 6.1: Tamil Nadu: Select Socio-economic Characteristics

Characteristic	**Tamil Nadu**	**India**
Human Development Index, 2001	0.531	0.412
Per capita Income, 20070-08 (in Indian rupees)	38573	33280
Literacy Rate, Total 2001 (%)	73.5	65.4
Literacy Rate,Male 2001 (%)	82.3	75.9
Literacy Rate,Female 2001 (%)	64.4	54.2
Rate of Urbanization 2001 (%)	44.0	27.8
Density (persons/sq.km.)	480	324
Sex Ratio (per 1000 males)	987	933
Rural Poverty (%) 2004-05	22.8	28.3
Urban Poverty (%) 2004-05	22.2	25.7
Combined Poverty (%) 2004-05	22.5	27.5
Agriculture's share in Gross Domestic Product(%)	11 %	17%
Proportion of workforce engaged in agriculture(%)	50%	60%

Source:
[1] http://www.tn.gov.in/dear/tab06/a1.pdf Table 1.1.
Population Census : Salient Features,At a Glance : Tamil Nadu and All-India
[2] http://www.tn.gov.in/dear/tab06/a124.pdf 20.1.
Trend in Incidence of Poverty in Tamil Nadu Vis-*à*-vis All-India
[3] Economic Survey 2008-09, Government of India (2009)
[4] Agricultural Statistics at a Glance, 2008

Table 6.2: The Survey Districts: Some Statistics for Rural Areas

District	Coimbatore	Dindigul	Erode	Karur	Madurai	Nilgiris	Salem
Decadal growth Rate in Rural Population,1991-2001(%)	-13.73	-9.87	-20.74	-8.86	-6.21	-13.21	-7.69
Human Development Index 2004	0.775	0.705	0.721	0.737	0.759	0.745	0.717
-Rank among 32 Tamil Nadu districts	4	23	15	12	7	8	17
Sex Ratio (females per 1000 males)	976	987	967	1008	979	1025	908
Scheduled Castes and Tribes (% of total population)	22.8	21.9	20.8	23.3	19.9	34.2	23.8
Male Literacy (%)	58.4	56.8	52.4	55.4	59.4	65.9	50.4
Female Literacy (%)	49.3	46.5	42	44.3	49.3	57.1	40.5
Cultivators (% of workforce)	19.8	25.3	27.9	26.8	20.7	6.2	30.3
Agricultural Laborers (% of workforce)	38.8	49.1	41.6	44.2	51.3	19.9	35.9
Percentage of cultivated area under irrigation	34.8	43.2	46.8	41.1	58.7	0.3	32.7

[1] Computed from the Primary Census Abstract, Census of India, 2001.

and extending backward to contract with farmers for good quality, long staple cotton for milling. Papaya was introduced in the region in the 1990s for extracting papain, which has wide-ranging industrial uses. The variety is appropriate, but not ideal, for table consumption, and the fruit is a by-product that is used to make candied fruit or for pureeing. Marigold contracting was initiated by firms for oleoresin extraction for export, mainly as coloring agent for poultry feed. Marigold has a thriving local market, however, for fresh cut flowers that are used for a number of occasions, religious and otherwise. The broiler industry in the study region is almost completely vertically coordinated, a process that began in the mid-1990s. Here, day-old chicks are provided by the firm and bought back by the contracting firm. The firm acts as an aggregrator-intermediary, but also has its own brand of chicken in various processed forms.

These contract commodities have significantly different attributes, contributing to diversity in contract farming arrangements. At the same time, they all symbolize new aspects of agricultural development in the region, represented by strong links downstream to not only to industry but beyond, to regional, national and global markets.

6.2.1 Cotton

Cotton is a relatively old crop, believed to have been introduced by migrant communities from northern Karnataka a few centuries ago when they settled in what is now Tamil Nadu. It figured prominently when the English East India Company first started trading in India. In fact, cotton provided the link between the trading company and local economy and continued to do so when India came under formal British rule (Parthasarathi, 2001). Early attention was bestowed upon cotton technology by the English East India Company, which attempted, apparently with little success, to improve yields of the three local varieties, *tinni*, *salem* and *karunganni*, to serve the colonial economy. In 1904, however, when the American variety grown in Cambodia was introduced into Tamil Nadu, it established the basis for the emergence of 'modern' industry and trade around cotton. A coincidence of circumstances such as the Great Depression and the decline of Bombay's textile industry served to provide enabling conditions for the growth of the cotton textile industry around Coimbatore (Chari, 2004; Damodaran, 2008).

Ever since, cotton has been a prominent part of the cropping pattern in the region around Coimbatore, a piece that fitted into the larger ecology of downstream users of cotton in the form of the textile industry (later on, the garment and hosiery industry as well) and the availability of black cotton soils of the region. Tamil Nadu is, today, part of one of three major cotton growing zones in India. Cotton is cultivated throughout the year in Tamil Nadu in four seasons, namely irrigated winter, irrigated summer, rainfed and following rice in the wetlands. Of these, winter irrigated is the most important.

The link between industry and agriculture has always been strong in the cotton sector and much has been written about the agrarian origins of capital that fueled growth in other sectors in the region (Chari, 2004; Harriss-White, 1996). There is huge demand for cotton within Tamil Nadu. In 2004, more than half the mills in operation in India were located in Tamil Nadu, consuming around 44% of total consumption by all mills in the country (East India Cotton Association, various years). Its production of cotton (all varieties) was, however, only around 7% of total production within India, implying that Tamil Nadu is a net-importer of cotton. The predominant variety that cotton farmers grow in the state are Superior Long (27 mm and above) and Superior Medium (22 mm to 24 mm), with the traditional Medium *karunganni* dominating. The major varieties cultivated in Tamil Nadu are MCU5, RCH and LRA-5166.

Industry sources and government estimates suggest that about 6-10% (and no more than 15%) of the Tamil Nadu's mills' varietal requirements are met from within the state. Perhaps this ensured cotton's viability, so that growth in cotton production was robust, initially during the decades spanning the 1970s and 1980s, and subsequently, during the latter half of the 1980s, when the garments and hosiery industry in Tiruppur burgeoned. This was also the period when yield growth became the main driver of increased cotton production, not just in Tamil Nadu but in other states as well (Figure 6.2). However, the cotton economy in Tamil Nadu began to splutter around the mid-1990s. Cotton lost appeal as a viable crop, and the area under cotton declined gradually, mirroring the national trend (Figure 6.2).

At the All-India level, it was not until 2003-04 that there was reversal in the trend of acreage under cotton. Two policy measures appear to have played a role. In 2001 and 2002, exports

and imports were placed under the Open General List (OGL), implying that they were freed from licensing requirements. As a miller put it "Cotton, like coffee, suddenly became linked to international markets, more than ever before, and price setting no longer happened within India".[7] With the incentive for exports of raw cotton, the higher annual price, and the increasing minimum support price for *kapas* (seed cotton), cotton reclaimed its place as a profitable cash crop (Figure 6.2). Trade data suggests that cotton now became an exportable commodity in several years. The year 2002 also marks the introduction of Bt Cotton, officially approved in March, 2002. This combination appears to have spearheaded a resurgence of area under cotton at the All-India level, led by Maharashtra and Madhya Pradesh.

In Tamil Nadu, these forces have been far more muted and it has not seen a cotton revival of a comparable magnitude. The trend in Tamil Nadu has been an increase in yield rather than in acreage under cotton. The recovery of cotton production is attributed, among other things, to "better prices" and "better yields"[8]. Interestingly, there is a perception that, unlike much of the resurgence of cotton in the northern and western states, while the accelerating uptake of *Bt* cotton might be playing a role as well, *Bt* cotton has received a guarded nod in Tamil Nadu, and has never been seen as a sensible alternative in rainfed tracts. [9] Figures suggest that *Bt* adoption in Tamil Nadu is around 33% of cotton acreage (Net Sown Area) in the state, less than half the proportion of Andhra Pradesh, for instance. [10]

A bit of the apparent cotton revivalism, however, is possibly due to the Technology Mission on Cotton, an initiative of the Government of India aimed at improving the productivity of cotton and the Cotton Corporation of India Ltd.'s Integrated Cotton Cultivation Programme, a euphemism for the promotion of contract farming by mills.

The scheme provided a nurturing umbrella for contract farming relationships between spinning mills and cotton farmers. The Tamil Nadu Government in its Agricultural Policy throughout

[7]Interview with a consultant for the cotton mills, Coimbatore, November 2007.

[8]Interviews with farmer groups, Coimbatore, September 2007.

[9]See, for instance,"Performance of Bt. Cotton Cultivation in Tamil Nadu", Report of State Department of Agriculture, Government of Tamil Nadu, http://www.envfor.nic.in/divisions/csurv/geac/srtn.pdf, Accessed January 2009.

[10]The source for this is "Performance of Bt. Cotton Cultivation in Tamil Nadu", Report of State Department of Agriculture, Government of Tamil Nadu, http://www.envfor.nic.in/divisions/csurv/geac/srtn.pdf, Accessed January 2009.

the early 2000s elaborated on a vision of welfare for cotton growers that gave contract farming a central role. In what has come to be known as a Tripartite Model for contract farming, the Government of Tamil Nadu brought together three cotton mills, the Cotton Corporation of India for contracting with the farmer. Further, the Integrated Cotton Cultivation Programme and the Tamil Nadu Agricultural University would render the research and development (R & D) support with the Commissioner of Agriculture providing extension support as well as training to the farmers. Commercial Banks would step in to provide credit facilities to the identified farmers with Insurance coverage and Dispute settlement, if any, shall be looked after by Central Institute of Cotton Research (CICR) (Government of Tamil Nadu, various years).

This carved out an institutional space for three mills to adopt contract farming. The mills of Tamil Nadu had already begun integrating vertically in the 1990s, covering operations starting with ginning to finishing garments for export(Damodaran 2008). Partly because of varietal issues and on account of the local supply deficit, most Tamil Nadu mills source cotton from other regions. Most mills, however, spin a wide range of cloth qualities and there is always demand for local cotton that is of good quality and free from contamination. Contract farming as a strategy was expected to serve this need substantially.

In the study region, at least three large cotton mills began to engage in contract farming around 2002; they are Appachi Cotton, Royal Classic Mills and Super Spinning Mills. Appachi Cotton was a pioneer of sorts and their scheme has often been considered a 'model' for others to mimic. The stated official estimate of area under cotton contract farming in Tamil Nadu for 2005-06 was 45000 acres (Government of Tamil Nadu, various years); a closer look reveals that this figure is an expression of intention rather than of accomplishment. Based on personal interviews with the firms, it appears that the actual extent of contract farming in cotton in Tamil Nadu fell well short of what was originally proposed, at no more than a few thousand acres.

In the years since, contract farming in conventional cotton appears to have waned and then retreated; the most recent document of the Government of Tamil Nadu articulating its agricultural policy has no reference at all to contract farming in cotton! By the end of 2008, while some mills viewed contract farming as a vehicle to source raw material, for others, it was a Corporate Social

Responsibility initiative. In the latter case, the responsibility of contract farming operations lay with divisions within the firms that had little to do with its main procurement operations. At the time of the survey, there was a concerted effort by some mills to promote contract farming of organic cotton, rather than conventional (or *Bt* cotton), which they felt was much too risky, and not worth the effort. It was organic cotton that they felt would differentiate adequately from the traditional cottons to enable contractual relationships.

6.2.2 Gherkins

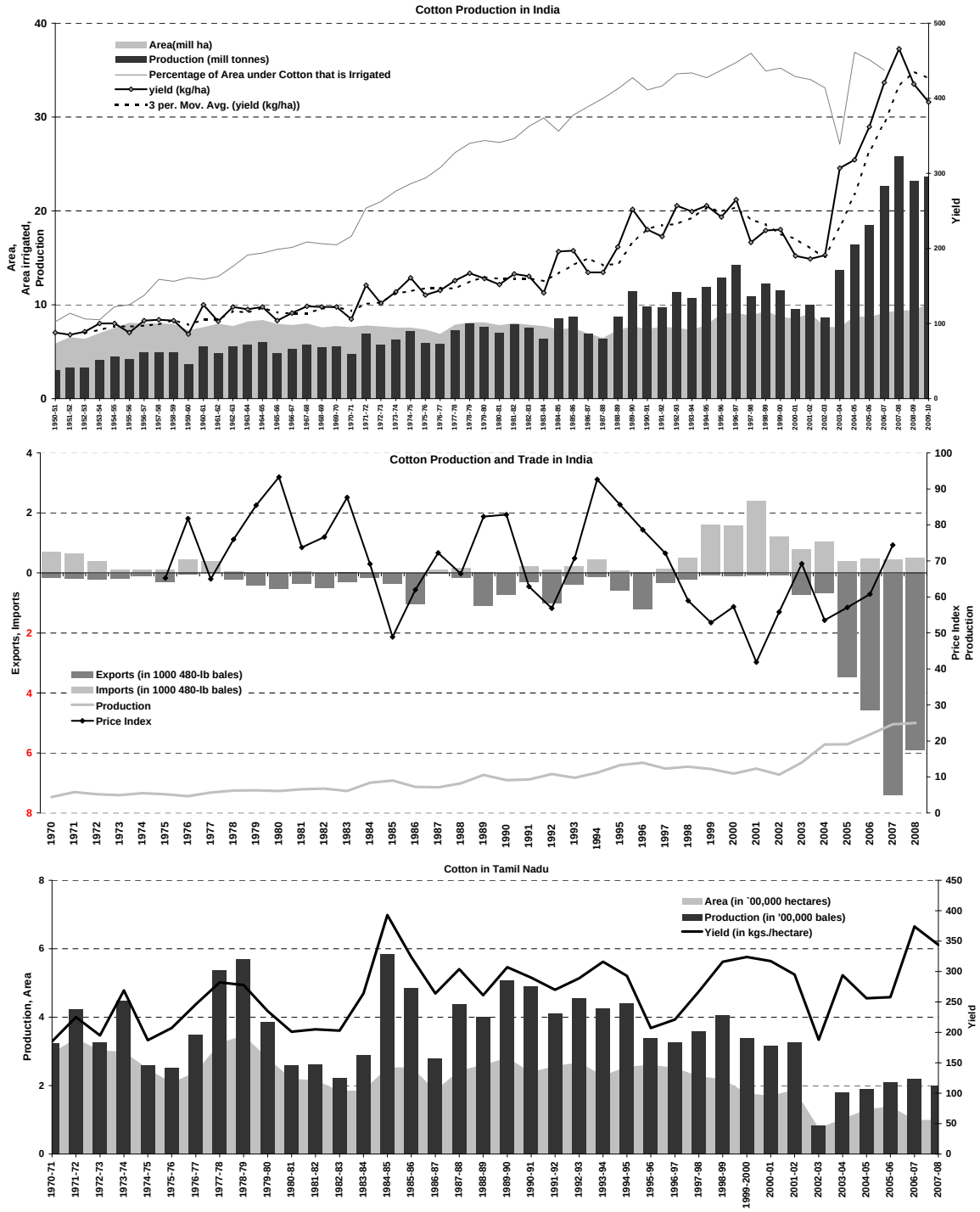
Unlike cotton, gherkin (a race of the species *cucumis sativus*) is as new to the study region, as it is to India itself. Inserted into the cropping pattern of the region in as recently as 1992, the emergence of the gherkins processing industry in India is emblematic of global shifts in agricultural sourcing. Until well into the 1990s, India occupied only the penumbral margins of world gherkins production. Towards the late 1990s, as gherkins cultivation declined in parts of Europe[11], it anchored itself in peninsular India, in the states of Tamil Nadu, Andhra Pradesh and Karnataka, likely owing to their access to ports. Within less than a decade, India had established itself as a prominent exporter of gherkins to the rest of the world (Figure 6.3), accounting for as much as 15% of world exports during the Triennium Ending 2006-07. The major destinations are Russia, the European Union and the US (Figure 6.3).

While the extent of gherkins cultivation is not recorded explicitly, a rough estimate, derived from trade data suggests that it could be as high as 10.4 million hectares annually.[12] Almost all the gherkins cultivated are processed, and all are sourced by processing plants through some form of contract farming. These plants typically clean the gherkins and preserve them in acetic acid, brine or vinegar, with spices. While most ship them out in large drums to importing countries where the commodity is processed further, a few plants bottle and brand or label them for retail sale by clients. The unit value of exports is naturally higher for the latter and at the time of this study, several plants were contemplating greater value addition through bottling and branding. In

[11] Industry observers indicate that owing to rising costs of production in southern Europe and Germany, the traditional areas for gherkins cultivation, international clients began to look for alternative sources of supply.

[12] This is computed as the volume of exports for 2007-08 divided by a benchmark yield of 5 tons per acre.

Figure 6.2: Cotton: Production and Trade, in India and Tamil Nadu



Sources: Compiled from Government of India (2008) Agricultural Statistics at a Glance, Government of Tamil Nadu (various years) Crop and Season Report, Trade data from USDA Cotton and Wool Yearbook, http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1282 Accessed, January 2009.

fact, trends for export of raw gherkins suggest that since 2005, fewer gherkins are being exported in the raw form, reflecting greater volumes being processed and preserved for exports (Figure 6.3) indicating that gherkins export from India is moving up the value chain. The price paid to the farmer is linked to the size of the gherkin itself, a higher price for smaller gherkins. The five size categories based on size fetch the farmer prices ranging from approximately Rs.2/kg. to Rs.15/kg (Figure 6.3). The unit value of exports suggests that it is about twice the farmgate price. Further, the farm-gate price constitutes about 3% of the retail consumer price in 2008-09.[13]

Until recently, raw materials used in processing, including barrels and vinegar were imported, but by the late 2000s, barrels began to be manufactured in India, so that the gherkins processing industry now uses, by and large, domestically produced inputs. The study area was one of the first to induct gherkins into annual cropping patterns emerging as the procurement sheds for pickling plants in Tamil Nadu. Over time, Karnataka, a later entrant into the gherkins complex, overtook Tamil Nadu, thanks largely to an organized and focused state government support to gherkins export industries. Nevertheless, Tamil Nadu now stands next only to Karnataka; industry observers suggest that Tamil Nadu might account for as much as 35-40% of India's gherkins exports.[14]

The epicenter for gherkins in Tamil Nadu is, as it was in its infancy, the town of Dindigul, located at the heart of the study region, and, to a lesser extent, Tuticorin. At the time of this study, in 2007-08, there were about seven gherkins plants clustered around Dindigul town, with easy access to both the hinterland that constitutes the procurement shed and to the Tuticorin port, from where export shipments leave. Almost all of them are 100% Export Oriented Units (EOUs), a Government of India nomenclature that extends benefits of export promotion policies, like subsidized electricity, a five year tax holiday and exemption of excise duty, to name a few. The formation of AEZs (Agriculture Economic Zones) offers similar incentives for processing plants, although it is not clear if gherkins plants had taken advantage of this. The gherkins plants in Dindigul district have varying degrees of technological sophistication and conversely labor intensity,

[13]This is computed as the simple weighted average contract price (for various grades) of the sample firm divided by the unit export value multiplied by hundred. The farmgate price divided by the retail price of gherkins in a retail store in the EU, obtained through personal communication with a gherkins importer, multiplied by 100. This is therefore merely indicative. Gherkins exporters and importers tend to be somewhat reluctant to disclose margins but five to ten percent is the figure cited by most Indian industry observers.

[14]Interview with bureaucrat, Bangalore, March 2007.

with between 70 to 150 employees on the rolls. Additional labor is hired on a contractual basis for the season, if necessary. Women appear to form the bulk of the employees.

Over the years, the ambit of sourcing gherkins has expanded to include regions as far east as Thanjavur, as far south as Tuticorin, Pudukottai and making inroads west into Coimbatore. In the study region, gherkins can be grown in up to two seasons every year. Being a three month crop, it is possible to get three crops a year in regions such as Thanjavur, enabling the plants to run throughout the year. Such geographical expansion does have its limits though, since gherkins are highly perishable and ideally need to be processed within eight hours of harvesting.

The gherkins processing plants often have the same markets, so that the rivalry in sourcing mirrors a similar rivalry in securing orders internationally. Beyond this rivalry, however, the gherkins firms coordinate their actions and come together to assist each other in meeting their respective obligations to exporters, or to represent a united front to lobby with the government. The best expression of this is the Gherkins Exporter Association of India (GEA), founded in 1999 and headquartered in Bangalore. While not all firms have implicit faith in the Association, the potentially deleterious effect of competing to source gherkins and the need to maintain a reputation in the eyes of international clientele necessitate such a forum.

The gherkins complex in southern India has now attained maturity, but faces continuous challenges. The main difficulties pertain to their predicament as an intermediary between Indian farmers and international clients. Competition upstream for sourcing from farmers means that they need to offer prices to match the others in the industry, especially in a context where the collusion on prices or coordination within the GEA is not reliable. Also, there is pressure on firms to compensate farmers better to keep pace with rising prices and wages in southern India, even as the firms compete for cheaper sources of produce. At the other end, the international market for gherkins is sensitive to general economic conditions and is itself searching for the cheapest source of produce across countries. This downward pressure on the selling price of gherkins leaves a few of the gherkins processors with wafer-thin margins, so that without state support for EOUs, some might not survive at all. Indeed, recent years have seen some firms close shop. There has been some consolidation as well, with the larger gherkins processors acquiring the smaller ones. There

is a general feeling among industry observers that the gherkins complex in southern India will last another decade or so before moving to lower cost areas, perhaps elsewhere in India, or even other parts of South and Southeast Asia. At the time of the study, some firms were contemplating procuring in Sri Lanka, for instance. For now, it seems that gherkins has grown strong roots in Tamil Nadu.

6.2.3 Broiler

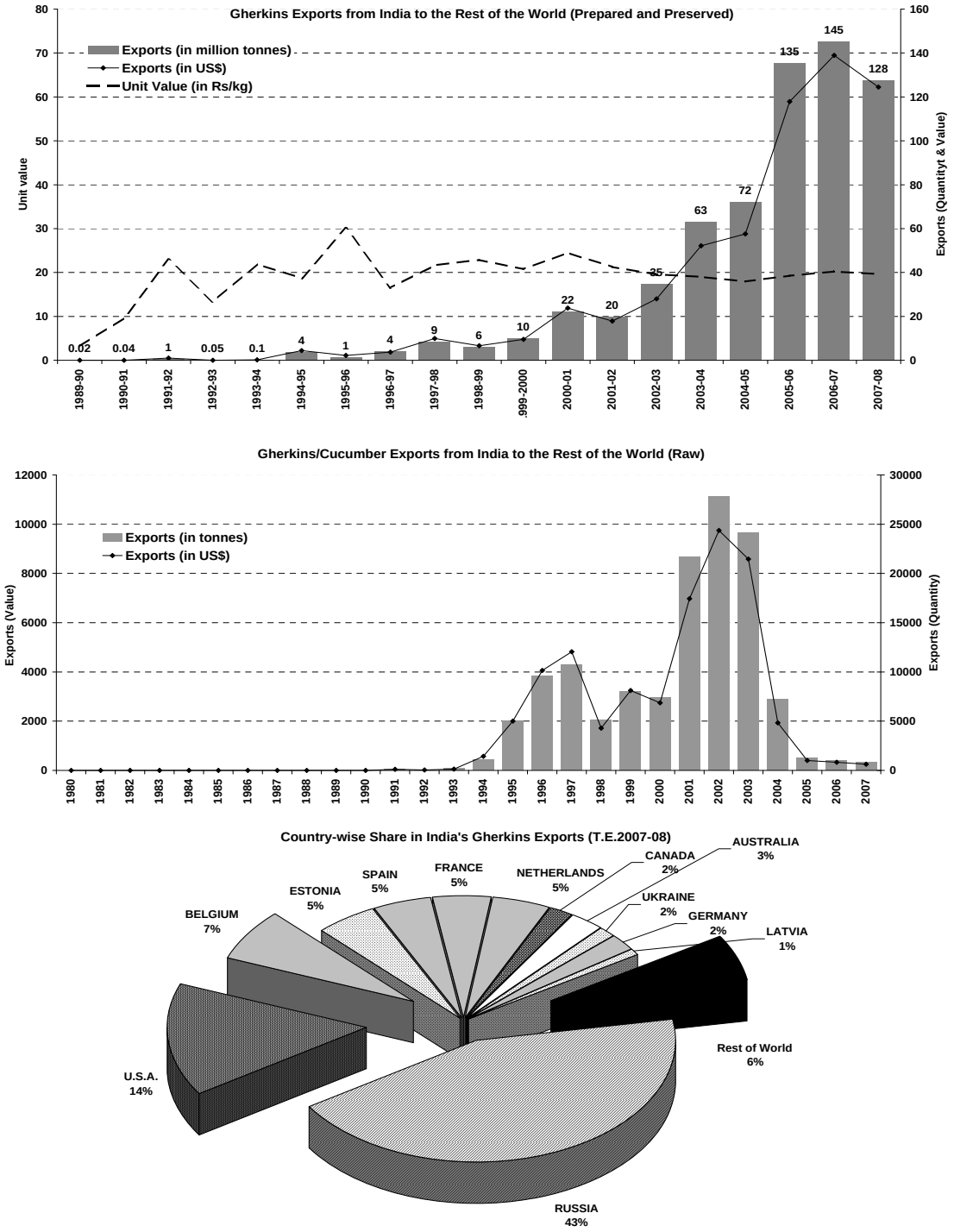
The broiler industry in India is touted universally as a success story.[15] In the last decades, the livestock sector has been one of the fastest growing sectors in Indian agriculture, currently accounting for about 25% of agricultural GDP, compared to less than 14% in 1980 (Government of India, 2008). Within the livestock sector, poultry has been an especially noteworthy performer. The growth of poultry has outstripped both overall agricultural growth, and the broiler industry has grown faster than other meat sectors in India (Figure 6.4).[16]

This expansion in broiler and egg production is attributed, on the one hand, to rapid growth in urban incomes and dietary diversification, and on the other, to changing market structure, from traditional spot markets to highly vertically coordinated contracting systems, that enables exploitation of economies of scale. Unlike gherkins, the poultry sector in India is buoyed by the domestic market rather than the export market. This is despite the fact that India's exports of egg powder, live poultry in the form of day-old chicks (DOCs), etc. have been on the rise since the 1990s. Egg and egg-based products account for about 90% of India's poultry exports. According to Mehta and Nambiar (2007) Indian poultry is not only self-sufficient, but being supported by a broad and strong genetic base, productivity levels (as represented by the Feed Conversion Ration) of broilers and layers are equal to those achieved elsewhere (e.g., in the United States of America and the European Union). India is also one of a few countries worldwide that has put into place and a sustained specific pathogen free (SPF) egg production project.

[15] For detailed discussions of the poultry sector, see Asokan and Singh (2003); Dolberg (2004); Landes et al. (2004); Mehta and Nambiar (2007); Mehta et al. (2002); Pica-Ciamarra (2005). This section draws heavily on their accounts of the development of these sectors.

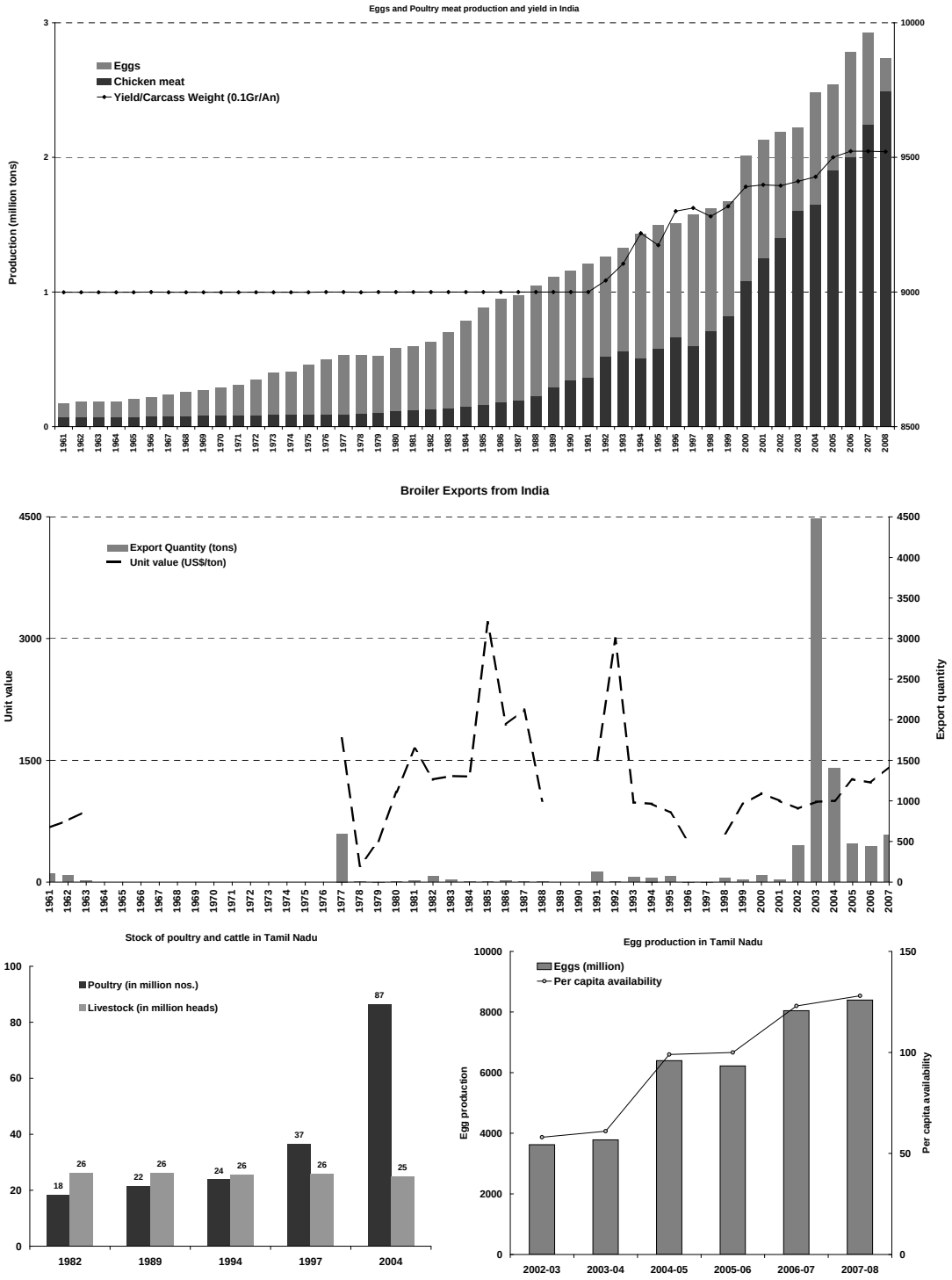
[16] The poultry sector in India refers to both the broiler and layer sectors, and unlike in other countries, where poultry refers to diverse breeds of birds, in India it is overwhlemingly chicken and a small portion of duck and fowl.

Figure 6.3: Gherkins: India's Production and Exports



Source:
http://apeda.com/TradeJunction/ProductSearch/exp_f_india.aspx?hscode=20011000&top_r=ALL&yr=ALL&hscode1=Cucmbrs/ghrkns%20prpd/prsvd and http://faostat.fao.org/ Accessed March 8, 2009 The data pertain to "Cucumbers and gherkins prepared and preserved" (HS 8-digit code 20011000) and "Cucumbers and fresh gherkins" (HS 8-digit code 07070000). Country-wise exports of gherkins are from UNCOMTRADE http://comtrade.un.org/db/default.aspx. Accessed March 8, 2009.

Figure 6.4: India's Poultry Sector



Poultry meat trade data are from FAOSTAT.Production of eggs and chicken meat are from FAOSTAT and Government of India (2008) "Agricultural Statistics at a Glance".

The poultry revolution was started in southern India by Dr B.R. Rao, who is commonly known as the Father of the Poultry Sector in India. The integration process was started by Venkateshwar Hatcheries in the mid-1980s in the south and the north, but it failed miserably in most areas when large numbers of small and medium farmers stopped producing chicken products. The layer industry too took a hit from the ban on egg and egg products from India by the European Union. The firm started contract growing again in the mid-1990s, drawing on the services of some of these experienced farmers, utilizing preexisting infrastructure such as sheds, drinkers and feeders, etc.

In southern and western parts of India (Karnataka, Tamil Nadu, Andhra Pradesh and Maharashtra), large-scale vertical coordination has been occurring at a brisk pace ever since, especially in broiler production. Pune (in Maharashtra) is a major poultry rearing hub, for example, about 6000 poultry farmers are on contract with Venkateshwara Hatcheries, popularly known as Venkys, or with the Godrej Group. In the West, about three-quarters of the broiler market is vertically coordinated. Similarly, in the south, particularly in around Palladam area of Tamil Nadu, which is part of the study area, integrators now reportedly account for over 80% of production and consumption, the major players being Vekateswara Hatcheries, Suguna and Swathi. Some observers claim that about 96% of the layer industry is vertically coordinated and the figure might be close to 90% for broiler.

Andhra Pradesh is the largest egg producing state, accounting for nearly 40 % of egg production in the country, followed by Tamil Nadu, whose share in the All-India average increased from 11.21% in 1997-1998 to 13.46% in 2005-2006. Today, eight states account for bulk of egg production in India Andhra Pradesh, Gujarat, Haryana, Karnataka, Maharashtra, Punjab, Tamil Nadu and West Bengal. As for broiler, it is similarly concentrated. In fact, one district of Tamil Nadu, Namakkal, alone accounts for more than 30% of total broiler production. Although, a major portion of poultry production is in several clusters, this is one of the most concentrated districts in India. The study area itself does not include Namakkal itself, but does include the adjoining areas including, Salem, Erode, Tiruppur and Dindigul that have emerged as broiler hubs. Per capita egg and chicken meat availability is also highest in the southern states, followed by the northern and western states, and least in the eastern and central states.

In contrast to southern India, in other regions, particularly in the north, traditional wholesalers

still dominate the markets and marketing margins and retail prices are considerably higher than in the south. Integration has moved rather slowly in the northern and eastern parts of India, with contracting accounting for less that half the market share in the East, and only 10% in the North. Initial efforts at large scale vertical coordination failed to take off in the north for various reasons. There was high seasonal variation in costs of production and contract enforcement turned out to be a problem. However, there are two or three integrators operating exclusively in the north along with some countrywide integrators.

In general, integrators have tended to establish wholesale and retail price leadership in the markets where they operate by reducing the number of intermediaries or by selling directly through their own retail outlets (e.g., in Coimbatore). In the broiler sector, there is no national organization that looks after the producers' interests. Barring a few regional organizations, broiler marketing is largely in the hands of big traders and commission agents in *mandis* (wholesale markets). In the study area, the Broiler Coordination Committee based out of Palladam is a strong organization of broiler integrators who set the price of broilers and control the volume of supply to maintain prices in their favor. There is no comparable farmers' organization. In the study area, currently, apart from the three big integrators, several small and medium scale firms operate to contract for broilers. While most of the country's large integrators operate here, there have been a few instances of broiler contracting firms going bankrupt in the late 2000s. There is much homogeneity in the details of contract farming arrangements.

While the transformative impact of this change is ongoing, backyard poultry and traditional channels continue to be a significant feature of the poultry sector in India. Only 2-3% of broiler is processed and the market in India continues to be dominated by that for live birds, owing to a strong consumer preference. According to the 2006 National Sample Survey (NSS) Report on Livestock Ownership (Government of India, 2006), landless, marginal and small scale farmers, who account for about 90% of the 107 million agricultural households in India, keep about 85% of the poultry stock of the country. These farmers keep poultry to serve their own needs and participate only marginally in local markets. In general, those who are commercially integrated with the broiler industry tend to be large scale growers who form a small proportion of poultry owning farmers.

Thus, while the Government of India acknowledges the promise of the poultry sector, with the Eleventh Five Year Plan 2007-2012 setting a target growth rate for the sector at 10% per year, which is above the envisaged 9% annual growth rate for total GDP (Government of India, 2007a), it also recognizes that "the poultry production model in vogue (high input-high output, using commercially developed strains of birds) is successful mainly in largescale units (more than 1000 units of birds)" (Government of India, 2002, page 568) and bypasses the landless, marginal and small scale farmers (i.e., those with less than two hectares of land), who raise the largest share of the countrys poultry stock (Government of India, 2006).

6.2.4 Papaya

India has seen spectacular growth in papaya cultivation, beginning in the 1980s and gathering momentum in the 1990s (Figure 6.5). It has also become an exporter of the fruit since the 1990s (Figure 6.5). In T.E. 2007-08, India accounted for 3.4% and 1.2% of world exports of papaya in terms of volume and value, respectively. This is consonant with the general trend in many other horticultural crops in India, attributable to the rapid growth of urban middle class incomes, changing demand patterns and increasing integration of India with the world economy (as elaborated in Chapter 5).

Much of the growth in papaya production during the 1990s has come from yield improvements, attributable to the introduction of Taiwan Red Lady, a table variety that has been adopted widely. The growth of papaya as fruit has been accompanied by a growth in papaya for extracting papain, which was nonexistent, by all accounts, until the late 1980s. There is no official record of the latter, but observers suggest that this is a minuscule proportion of total papaya production in the country. Papaya for papain production, in India and elsewhere in Asia, has emerged in response to the growing market for papain in the US, EU and Japan. The enzyme has wideranging industrial uses and is exported, chiefly to the United States and the European Union. In India, Co2 and Co6 are varieties of papaya are recommended for papain production for the higher enzyme activity in the latex from these fruits.[17]

[17] Co2 is a selection purified from a local type at Agricultural College and Research Institute, Coimbatore.

The sample firm makes papain enzyme that is extracted from the latex drawn from the skin of the immature papaya fruit and as a subsidiary product, fruit pulp and jam. The main clients for pulp for the sample firm comprise a few big juicing plants within India. A small proportion of the fruit is also converted to candied dry fruit and sold to confectioneries and bakeries in the study region.

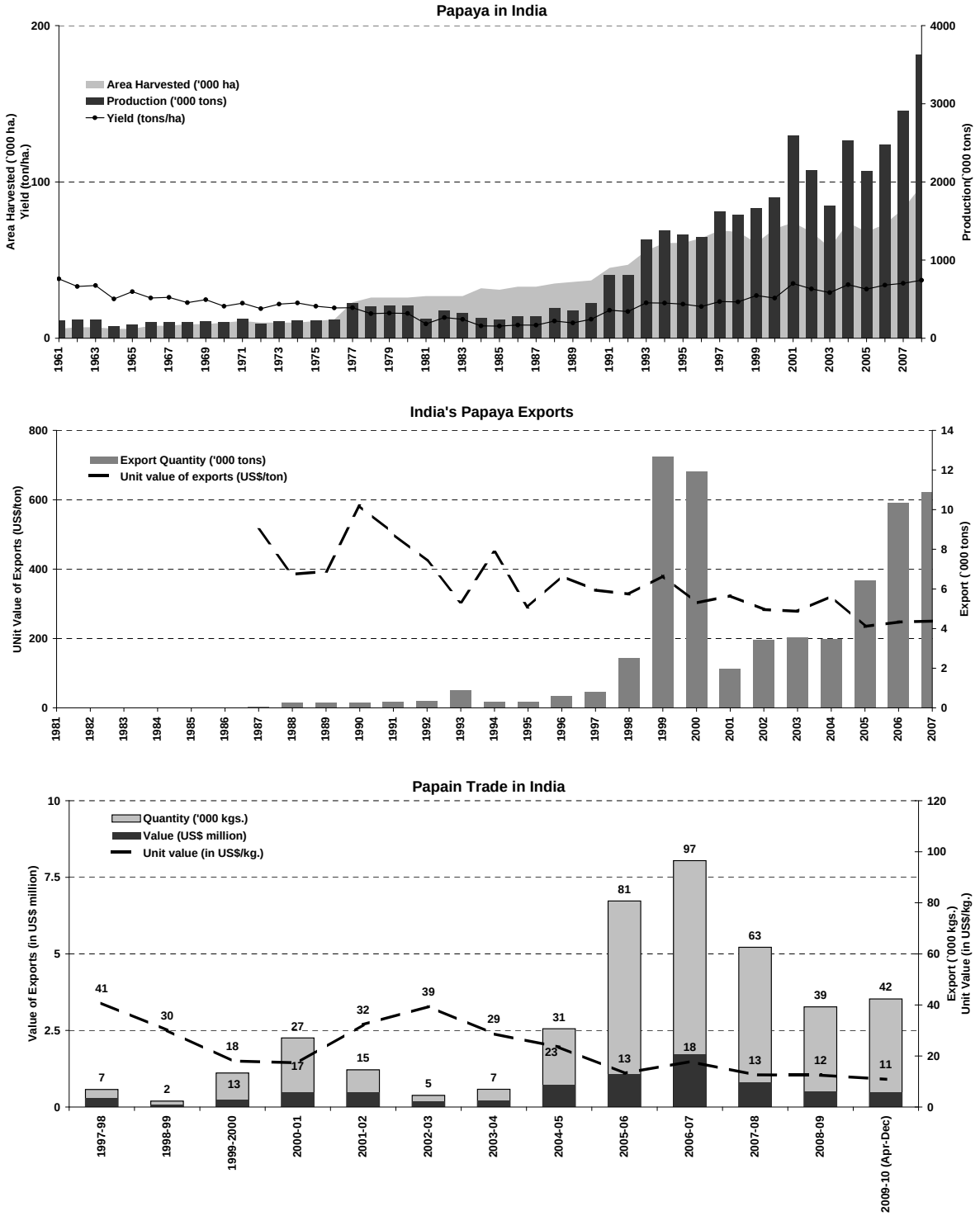
Within India, Tamil Nadu has never figured on the list of papaya producing states throughout the 1980s and 1990s. It was neither cultivated nor consumed widely in the region. As recently as T.E. 2008-09, Tamil Nadu accounted for only 0.43% of the India's area under papaya and 2.2% of the total production. Yet, papaya cultivation for papain extraction is almost exclusive to Tamil Nadu.

Papaya, like gherkins, is new to the study region. Traditionally, papaya was rarely grown as a full-fledged crop, and was common more as a backyard tree or as an intercrop. Red Lady was the dominant variety, appropriate for table consumption. It was in this setting that the contracting firm in the study established a papain extraction plant, and persuaded farmers to take up papaya (the Co2 variety) as a contract crop. The owner of the plant started his own professional life as a struggling dryland farmer in the region, who then worked his way to setting up a modest sized plant in the late 1980s. He started trials in 1989, establishing operations on a commercial scale in 1994.

The number of firms worldwide involved in primary purchase of papain is very small and all have their traditional sources of supply. Most exporting countries are in Africa, with the Democratic Republic of Congo being the largest supplier. Australia and India are only just establishing themselves as exporters of papain. Many importing countries further process their papain imports and reexport to one another or reprocess it for further sale to fit end user specifications.

The international papain market is thin, with a very small number of players. Partly on account of this, most international trade in papain is based on contracts. Most exporters of papain first obtain contracts for supply for the following year, before organizing supply or undertaking planting on farmers' fields. Contracts also carry specification of the quality of papain, which is related to the level of papain enzyme activity, measured in Thyrosine units (TU). Industry observers note

Figure 6.5: India's Papaya Production and Papain Exports



Source: Compiled from various sources. Papaya Production and trade data from FAOSTAT. Accessed July 30, 2010. Papain exports data compiled from DGCIS. Papain, as of 2010, refers to "Papain, Pure of Pharmaceutical Grade" with HS-8 digit code 35079071. The 8-digit ITC-HS is with effect from January 2, 2003. For years before that, the figure corresponds to same commodity group under the older HS. For years before 2002-03, the figure corresponds to the same commodity description under the older classification system.

that the price is proportionately cheaper for higher graders of papain. Further, the thin papain market renders international papain prices highly volatile, depending on the supply conditions in exporting countries, especially those in Africa. Figure 6.5 shows the trend in exports and unit value of exports since 1997-98. It is evident that although the papain exports have been growing, there is also some volatility in the volume of exports, which in turn have impact upstream on procurement volumes from farmers.[18]

At the time of field research for this study (2007-09), the contracting firm was the only firm in the area involved in papain extraction. Others attempted to enter this industry in the study region and failed. There were few other firms in India that export papain during 2008-09, although this is probably changing fast.

6.2.5 Marigold

Marigold was introduced into the study area from Mexico in the early 1990s on a commercial scale, mainly to support the establishment of three plants in the region that extracted oleoresin for export. Oleoresin has three main uses- as coloring agent in food and additive in poultry feed and neutraceuticals. The potential for its increased use in the latter segment is high as studies in recent years have recommended use of lutein in food as it would help protect against cataracts and macular degeneration, two common age-related eye disorders. Most of the oleoresin produced by the three plants is exported to the United States, European Union and to Mexico. Industry executives suggest that India accounts for about 25% of the world marigold oleoresin exports, with China accounting for about 50%. Peru is the other important exporter.

Marigold demands very specific agro-climatic conditions, requiring cooler climates for optimal yields. In Tamil Nadu, it is confined to elevated, hilly regions or cooler foothills. Within the study region, this comprises the northern edge.

Until marigold's introduction into the area it was never a popular flower for cultivation. In Tamil Nadu, its ceremonial uses were restricted to funerals and it was considered inauspicious to

[18] As described already, this implication follows from the practice on that part of papain exporters of securing international orders *before* making procurement decisions. Export of papain is a coarse indicator for international orders secured by plants within India, given that firms treat this latter information as proprietary information.

use these for other purposes. This has changed somewhat over the years and the distinction between various uses has become less important. Also, with greater connectivity to regional and national markets, such as Hyderabad, Bangalore and distant Mumbai, where there are no such taboos for marigold use, it became an attractive crop. Marigold from the study area now serves more markets, where flowers have wider daily uses. There is thus a thriving market for marigold that serves as a credible alternative for the farmer and constantly puts pressure on the firms.

Industry observers suggest that the market for oleoresin is similar to that of papain. A small number of importing and exporting companies working with traditional suppliers make for very thin oleoresin markets. Oleoresin prices tend to be volatile. Similarly, the volume of international orders that the oleoresin extracting plant gets can also vary substantially from year to year, as reflected in Figure 6.6.

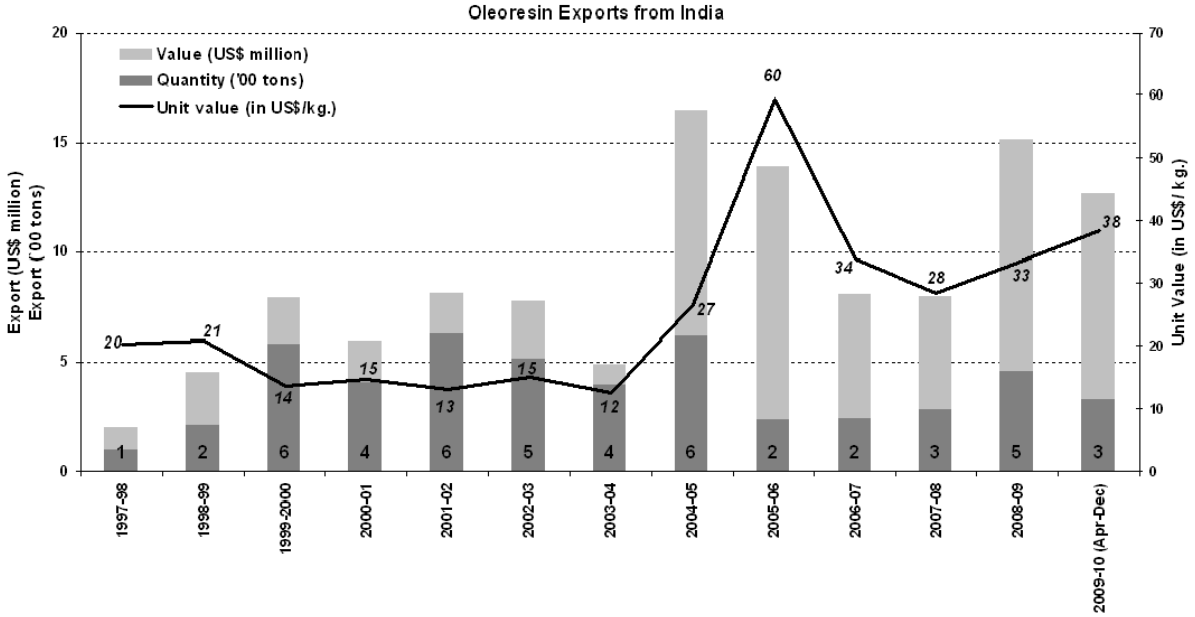
The firms have faced fluctuating fortunes. The three firms, Synthite, AVT and Kancor, are family-owned businesses, who have a long presence in multiple sectors. Kancor is the youngest of them all and was established in 1999. In the years 2004-06, firms expanded marigold procurement considerably and all three were contracting for produce across extensive swathes of land in the northern fringe of the study area.[19] Since this time, the firms have had difficulties managing the scale of operations, mainly on account of fewer international orders. In fact, two of the three firms had temporarily stopped operations until 2009. At the time of the field survey, only one firm was contracting for marigold.

Apart from the uncertainty in securing international orders, the firms have had to contend with other problems. In 2003, protests from local villagers against the contamination of water from the extraction plants forced one firm to shut down and relocate to another district, farther from the procurement shed. Plants have had to invest in pollution control measures.[20] More recently, with contracting defined against a strong alternative domestic market, the firm has faced serious challenges with regard to enforcement of contracts. The fact that the marigold growing season coincides with key festivals in the study region implies that the prices for fresh flowers increases at

[19]In fact, this area is only a small portion of the volume of procurement, with a majority coming the neighboring state of Karnataka, from across the border.

[20]This is based on the interviews with the firms, and is not independently verified.

Figure 6.6: India's Oleoresin Exports



Source: Oleoresin from marigold is classified as of 2010 under HS-8 digit Code 13021990 "Other Extracts Vegetable Saps and Extracts, whether or not modified derived from vegetable products". The data for trade is obtained from Directorate General for Commercial Intelligence and Services (DGCIS). The 8-digit ITC-HS is with effect from January 2, 2003. For years before that, the figure corresponds to same commodity group under the older HS classification system.

these times to several times the contract price tempting farmers to breach. Given weak enforcement of contracts and the fact that the firms contracts with a large number of very small farmers, the firms have struggled to maintain the contracting arrangements.

6.3 The Contract Farming Schemes

This study focuses on one firm's operations in each of the commodity complexes described above.[21] This section outlines briefly some salient features of the contract farming arrangements to introduce the schemes, mainly based on interviews with the contract firm's executives, field officials and observations from the field. Several of these themes will be taken up for detailed discussion in subsequent chapters.

[21]The names of the firms are withheld in keeping with Non-disclosure Agreements to protect the identity of both the firm and their contract suppliers.

6.3.1 Scale and Evolution of the schemes

The scale of operations varies across the commodities, and interestingly, over the lifetime of the scheme as well. All the contract firms selected for the study started their operations in the 1990s, but have followed different trajectories.[22]

The cotton firm's efforts at contract farming are the most recent. The firm originally started contracting in 2003 with 600 farmers in 25 villages, and over the next three years dwindled to 130 by 2006-07. In the season of the survey, the cotton firm was procuring from 77 farmers in a handful of villages in the study region.[23] As a company executive stated, we "find that 200 farmers or so is reasonable for us as a CSR initiative, but it doesn't make sense otherwise. We need 10000 bales, we get 150-200 bales from contracting and scaling up is not possible."[24]

When the papaya firm commenced operations on a commercial scale in 1994, the area under contract was about 1500 acres in the first year. Over the next decade, the firm scaled up gradually to around 2000 acres, contracting with 500-600 farmers at a time in three districts, namely, Coimbatore, Erode and Dindigul. In recent years, however, owing to extensive yield loss due to mealy bug and fewer international orders, this has reduced to 600 acres of tapping area with around 120 farmers. At the time of the survey, the firm was exploring new areas for expansion and several of the contract farmers were contracting for the first time with the firm.

The broiler firm has a more chequered history in the region. In 1984, the firm began procuring broiler through contracts, but gave up operations soon after, due to several constraints unique to the firm. It resumed contracting within Tamil Nadu in 2004 on a large scale. The procurement shed straddles three districts, Erode, Dindigul and Coimbatore, with offices in three hubs, Coimbatore, Pollachi and Dindigul. At the time of the survey, there were around 400 contract growers in these three districts.

The gherkins firm has the largest scale of operation in terms of acreage of contract procurement. It started commercial operations in 1999. By 2008, the firm has expanded to contract from over

[22] Chapter 10 discusses the dynamic aspects in greater detail.

[23] The firm had contracted with 93 farmers in the summer in another area, after which they abandoned contracting altogether in the latter region.

[24] Agribusiness Survey, Tiruppur district,Tamil Nadu, March 2008.

5000 farmers spread over more than 3000 acres and has stabilized at that scale, though depending on the economic conditions in the importing countries, this fluctuates a bit from year to year.

As described earlier, marigold procurement is confined to mid-elevation regions in Erode district. The has been contracting since inception in 1992, but with intermittent breaks owing to a lack of international orders. The most recent of such spells was the year 2006 through 2008, when procurement was from only a fraction of the farmers. At the time of the survey, the firm was procuring directly from about 150 farmers within the study area.

The spatial dimension of operations varies across these schemes (Chapter 7). Broiler and papaya contract farmers are scattered over a large area with typically a handful of growers in each village the firm operates in. In contrast, for marigold, cotton and gherkins, the firms follow what is known as the 'cluster' approach, so that contract farmers are densely concentrated in particular villages. For instance, in the case of gherkins, in villages where the firm contracts, typically only one or two cultivators are *not* contract suppliers. The marigold procurement shed is confined to the hilly regions of Thalavady and Kadambur in Sathyamangalam taluk in Erode district. Marigold demands cooler temperatures and yield more flowers under these conditions. The firm's plant is located at the foothills. Cotton similarly requires particular soil types and climate, so that the firm procures exclusively from traditional cotton growing areas of Coimabatore and Salem districts. Gherkins cultivation is confined mainly to Dindigul and parts of Madurai districts in the study area, tied in part to the location of the processing plant. This is primarily owing to the high perishability of gherkins that demand quick processing of the harvested produce.

The study area represents only a subset of their procurement shed for all contract commodities other than cotton. All of the cotton that the mill procures is from within the study area. For gherkins and papaya, a major proportion of the contract procurement is from within the study area, with procurement from other areas accounting for about 5-15% of total procurement by the firms. In the case of broiler, the firm operates across the country. The procurement from Tamil Nadu accounts for between a third and a half of their countrywide operations. Similarly, in the case of marigold, a major portion of the firm's procurement comes from the neighboring state of

Karnataka so that only a small portion of the contract produce is sourced from the study area. The firm's executive puts it at 25%.[25]

6.3.2 Operational Aspects

For all field crops, firms contract acreage rather than quantities, so that the firm takes on the yield risk. This is a shared feature across schemes in India, and is quite different from practice in most developed countries, where contracts are written in terms of quantities. Firms and farmers arrive at how much land the farmer will bring under the contract crop, and the firm provides seeds for that acreage, factoring in the spacing recommended for optimal yields. In the case of broilers, it is equivalent, in the sense that the maximum number of birds per contract cycle is determined by the size of the shed and the number of feeders and drinkers available for use, with the final buyback based on live weight of the birds.

In the cotton scheme, seeds come from the mill's own breeding division that has developed a variety appropriate to their needs. A multinational input provider partners with the firm and provides the farmer with inputs at cost, monitors the crops and also provides advice. Loans are offered by commercial banks against the contract but they also require that the land documents be deposited with them. No farmer seems to be clear as to the consequences of default. In some cases, firms contract with groups, but the group contract is notional and often involves a large landowner with several marginal farmers that the lead farmer has identified. In general, some sign contracts, and other do not. Some farmers sign contracts directly with the firm, others have a contract with the lead farmer (Chapter 10). The price is not fixed and is linked to market price, a mark-up over a wholesale price for an agreed reference period.

In the gherkins contracting scheme, every farmer has a passbook. Three copies of these are made, one is with the farmer, the second is with the procurement wing of the firm, the third copy is filed with the head office at the gherkins factory. The procurement wing also provides inputs to the farmers, including pesticides and fertilizers, according to a set of recommended practices. Five grades of gherkins are identified. These grades are related to the size of the gherkins, the smallest

[25]The area in Karnataka from where marigold is sourced shares the same geographic and socio-economic conditions and form a contiguous unit constituting the Sathyamangalam hills.

size commanding a premium, at Rs.14/kg. and declining to Rs.2/kg. as the size increases. Pricing is fixed up front, before sowing, and interviews with firms in the region suggest that industry buyers coordinate on farmer price to prevent undercutting. Grading takes place in the presence of the farmer at harvest time, when a sieve separates gherkins by size. At this stage some obviously poor quality produce (very crooked, rotten and so on) is winnowed.

The papaya contract farming scheme is unique in this region. The firm in question is a pioneer and also the only one operating in the study area currently. The study area is not a traditional papaya growing region and observers suggest that it was a highly unpopular fruit until recently. So although the firm is a monopsonist, it is dependent on a small pool of papaya contract farmers for its supply. The agreement with the farmer is mostly oral, and when there is a written contract, it is usually modeled as a land leasing arrangement rather than as a marketing contract. Thus, the terms of the contract do not find explicit mention in the document, but is agreed upon orally.

The firm supplies seeds, for which the farmers pay. The variety that is cultivated is Co2 and the farmer undertakes to follow a package of practices recommended by the firm, procuring the required inputs on their own. During the nursery stage, there is close supervision and assistance, with the field officials of the firm visiting the farm on a daily basis. During the flowering stage, make and female trees are identified; culling is done at this stage. Once the tree starts producing fruits, after the seventh month, the firm assigns two laborers to each farmer for extracting latex. The farmer pays the wages, but because latex extraction requires skill, the firm trains a pool of workers themselves for the purpose. The equipment for harvesting is provided by the firm, although occasionally the farmer takes on this responsibility.

Once the latex is collected, it is stored in drums provided by the firm for that purpose. The latex needs to be taken to the plant as soon as possible and it is the farmer's responsibility to bring it to the local collection centers. Quality is measured rigorously with the help of the Brix meter that monitors papain activity and latex is weighed in the presence of the farmer. Farmers often check the reading themselves, using the Brix meter, having been taught its use by the firm. Accounts are maintained on the farm and at the collection center. The terms of the contract are very clearly

specified here. The contract price for latex is specified "as Rs.90/kg.. latex at 17 degrees".[26] Once the latex has been extracted from the fruit, the firm agrees to buy the fruits from the farmer at a prespecified rate (Rs.0.75/kg.). Payment is made at the time of collection, or within a fortnight of delivery. It is mutually agreed of course that the farmer will not divert or side sell, nor adulterate the latex with milk, flour, water, etc.

The marigold firm first establishes the acreage a farmer wants to commit and distributes seeds accordingly. Seed distribution takes place in early summer (April-May). Seeds are obtained from a multinational seed company. The variety that was in use during the time of survey was Peruvian. The firm usually collects money for that, although it subsidizes the cost of seeds heavily. At that time, the firm typically signs a written contract with the farmers that fixes price and has the farmer commit that all produce from the acreage contracted is delivered to the firm. The contracting firm also provides credit, or cash advance, to farmers if they need it, apart from the required fertilizers, herbicides and offers technical support should the farmer require it. Typically, for each crop of marigold there are 7-8 harvests. Flowers are harvested weekly. When they harvest it they put it in bags given by the firm, stitch it and bring it to different collection points for weighing. Sometimes, they are picked up at the farmgate. Payment is made weekly in settlement of the previous week's delivery minus any amount owed to the firm, sometimes in installments. Entries for transactions are made in a passbook.

The system of contracting in the broiler industry is remarkably similar across firms. Under this system, the integrator invests in the entire value chain, including grandparent farms, parent stock farms, hatcheries and feed mills. Poultry farmers invest in poultry sheds and equipment on their existing land. Integrators provide day-old chicks, feed, medicines/vaccines, training to farmers in process and cost management, and technical supervision. Integrators pick up the broilers at around 42 days of age (six weeks), and farmers are paid growing charges according to a formula that factors in feed cost and a given productivity norm based on the feed conversion ratio (FCR). The farmers are given an incentive bonus if the FCR and/or mortality rate is better than the contracted level. The birds are weighed on farm and collected on site. Payments are made within a week. Although

[26]This was for the year 2009-10.

the contract is fixed for a 42-day cycle, typically the firm communicates to the farmer the number of cycles the farmer will be provided for the whole year. This is by way of an oral agreement. For the farmer, given the fixed investment in sheds, drinkers and feeders, ideally they seek to undertake six cycles of contract production annually. The placement of the birds is however the firm's discretion, and often this varies depending on the firm's particular strategy to exert control over supply conditions.

6.3.3 Relationship intensity

In many ways, the five schemes are fairly typical of contract production arrangements elsewhere in the developing world. All contract commodities are cash crops and involve production processes that require farmers to respond continuously to the need to maintain quality. These quality standards are often established outside the production system, driven by end-user preferences. In the case of gherkins, food safety issues imply stringent norms governing the use of inputs, fertilizers and pesticides, especially of pesticides that need to be on the "approved" list of the importing country. So too with poultry, that enters domestic food chains directly. In the case of cotton, quality is expressed as the need for exporting mills and garment manufacturers for Extra Long Staple (ELS) cotton that is not contaminated, i.e., free from impurities and particulate matter. In the case of papaya and marigold, while the varietal choice is more critical than the production process, they do require good cultivation practices, especially for papaya, that ensure high yield and care during harvesting.

Firms engaged in contract farming thus engage actively in the production process, not only providing critical inputs but also maintaining close supervision from sowing through to harvest and post-harvest handling. The commodities and firms selected for study represent varying degrees of involvement by the firm in the production process or intensity of contractual relationship.

The cotton firm brings in a third-party input manufacturer to monitor and advise farmers, arranging for credit from a bank and providing materials to store the harvested cotton. The mill's role is confined to coordination and oversight of operations.

The gherkins firm provides farm inputs (seeds, fertilizers and pesticides) on credit; this is

later recovered from the farmers at the time of harvest, when farmers are paid for the produce, net of input costs. Field officers on the company's rolls monitor crop health and advise farmers periodically.

Broiler represents even higher relationship intensity with the firm's officials visiting contract growers every day to monitor health and status of the birds. These firms provide day old chicks to the farm and has detailed protocols for the feed mix and vaccination schedules.

For papaya, the involvement of the firm varies over the life cycle of the crop. In the nursery stage, field officials monitor the crop closely with daily visits and once the plant matures into the flowering stage, there is limited oversight, unless the situation demands it. In papaya, an interesting feature is that labor for latex extraction is organized and trained by the firm, with the wages being borne by the farmer. Latex extraction requires great skill and the firm believes it can ensure quality and supply of latex for the plant by deputing labor to contract farms.

Marigold represents the least participation of the firm in the production process, related partly to fewer quality requirements that need only modest supervision. In fact, the marigold firm suggests that monitoring is required more for contract enforcement rather than for production under contract. The marigold firm thus restricts itself to providing high quality seeds at subsidized prices and training new contract farmers in the cultivation practice for marigold. Its field officials advise farmers periodically on pest and disease control.

6.3.4 Challenges and future

Despite the many shared features, the schemes are set up for very different futures. The chief challenge stems from enforcement issues. In a context of weak mechanisms for public contract enforcement through the courts, firms have had to work hard to ensure that farmers honor their contract. In general, the greater the interdependence between farm and firm, the greater the chances of a contract farming system enduring. The commodities chosen for the study occupy different positions on a scale of interdependence.

Some commodities offer certain natural advantages over others. Papaya comes close to a symbiotic relationship. Committing to contract is necessarily a two-three year lock-in, with limited

options outside.[27] In the case of marigold and cotton, however, the contract farming scheme is embedded in an already existing crop complex that readily accommodates side-selling by farmers. The cotton complex has been documented extensively by researchers. Contract cultivation methods are not very different from cultivation for the spot market. Both farmer and firm can resort to spot market trade at any time. Even in this case, however, the varietal differences imply that ELS cotton commands a premium that would *prima facie* differentiate the contract crop from local varieties of cotton farmers might grow. In fact, the cotton firm selected for study has its own research division that works with crop varieties and develops its own hybrids. During the time of study, the variety contract farmers grew was a hybrid developed by the firm.[28] Despite this, farmers disgruntled over price and quality issues, do sidesell to their customary traders. The year of the survey marks the last season the cotton firm contracted for conventional cotton. The company was proposing to explore contract farming in organic cotton at that time.

This is far less true of gherkins where the moral obligation to sell to the contracting firm seems high. As is often the case with export crops, for gherkins, there exists no alternative market in India. However, over the years, the number of gherkins processors has increased over time and the intense competition between the firms ensures that there are credible alternatives for the farmer even without domestic markets. In general, however, firms that have been operating in the region for long do not "cross-purchase" or poach other firms' suppliers. However, newer firms and those from another region sometimes do. Interviews suggest that in the recent past, this happens only in isolated circumstances and only with some "deviant farmers". As an executive explained, "that is why there are the field officers, they keep a very close tab and if the character is not good enough, we remove them from our suppliers list".[29] Broiler occupies somewhat the same spot as gherkins on the scale of interdependence, and there is tight oversight on the part of the firm. Although there are competing firms, firms tend to respect each other's turf and farmer loyalty to the firm tends to

[27]Once the latex has been extracted,the fruit does not fetch remunerative prices on account of the lacerations on the skins.

[28]Farmers were given a choice of five types they could grow. In the year of the survey, the farmers were all growing the same variety.

[29]Agribusiness Survey, Dindigul, Tamil Nadu, November 2008.

be high (Chapter 10). In general, although relationship intensity is primarily to ensure that quality norms are achieved, they often do contribute to improved contractual performance.

However, enforcement is not the only challenge firms face. Sometimes, relationships between the firm and firm come under great strain when there is yield loss triggered by catastrophic risk. For instance, a mealybug infestation in papaya throughout the region left farmers disillusioned with contracting for papaya. Similarly, when gherkins is grown repeatedly on a plot, without rotation, the yields taper off or decline, due to soil nutrient depletion. Firms often move to another region to procure. In marigold, nematode infestation poses problems, after repeated seasons of cultivation. The more diligent field officers of contracting firms are careful to advise the farmers on appropriate steps to prevent these outcomes. However, should these happen, such consequences can undermine carefully built relationships.

Furthermore, processors who focus on export markets face the constant pressure of keeping costs of procurement low in the face of global competition. The global nature of the system implies that fluctuations downstream in international markets, either in the nature of shrinking demand on account of economic slowdowns or a good crop elsewhere or emergence of new global procurement sheds have impacts upstream on the firm's contracting strategies. This uncertainty is a source of perpetual stress for firm-farm relationships.

6.4 The Survey

The following chapters take up three aspects of contract farming practice across these five commodities - farmer selection and churning, risks and gains from contracting, and the issue of enforcement. The empirical analysis draws on both qualitative data collected through detailed interviews with firms (henceforth Agribusiness Survey) and farmer groups, copies of contract documents as well as a survey of farmers (henceforth Farmer Survey).

The Farmer Survey constitutes detailed, structured interviews with 822 farmers covering five commodity sectors, cotton, gherkins, marigold, papaya and broiler in southern India (See Appendix A for details on survey design and implementation). The survey was done in two phases between

2007 and 2010.[30] The study area, involving seven administrative districts in the state of Tamil Nadu is heterogeneous in terms of agro-ecology, physical geography and socioeconomic development, as detailed above and includes districts that figure among the richest as well as the poorest quintiles in India.

The list of contracting farmers for the year of the survey was obtained from one contracting firm in each of the commodities studied. Based on this list, all the villages in the sample area were divided into contracting villages or non-contracting villages. A similar exercise was carried out sequentially for the larger administrative units, blocks and districts. Starting from the largest administrative unit for the study area, contracting districts were sampled, within which, contract and non-contract blocks were randomly sampled and then further on, within sampled blocks, contract and non-contract villages were sampled. In the villages sampled, a census / houselisting process identified four key types of farmers,those currently contracting, those who grew the contract crop but for the open market or for other firms, those who had given up contracting and those who had never contracted. The sample respondents were randomly selected from each of these types. Appendix A describes in detail the sampling strategy and its rationale in detail, outlining the distribution and coverage of sample across administrative units and farmer types.

While the empirical work draws on detailed interviews with various field officials and executives from the five firms selected for study, this is supported by a broader survey of agribusinesses across several other commodity sectors operating in other regions in India. The dataset from the Agribusiness Survey constitutes interviews with executives and field officers of 42 agribusinesses across India engaged in contract farming, and offers an opportunity to understand the similarities and differences in contracting experience across regions and commodities.

[30]The number of farmers interviewed were 840, but data for only 822 was used, due to problems with date quality in 18 interviews. Gherkins is represented in both phases. Wherever relevant, the results are reported separately for the two phases.

Table 6.3: A Snapshot of the Sample Contract Farming Schemes

Commodity	Districts in the Study Region	Type	Use	Alternate Market	Number of farmers	Remarks
Marigold	Erode, Coimbatore	Family Owned, private limited company	Extract Oleoresin and Lutein for export	Local fresh flower market and competitors	200 farmers (2007). Operations in Karnataka larger, around 2000 acres, over 1000 farmers	Initiated operations in China, fluctuating international markets.
Cotton	Coimbatore, Salem	Private limited company	Vertically integrated, miller and garment firm, exports and domestic	Established local market	76 farmers (2008)	Groups and individual contract, credit and extension form part of contract. The scheme folded up in 2009.
Gherkins	Dindigul, Madurai	Foreign owned, private limited company	Pickled and exported, barrels and bottle	No local market, several gherkins processors	5000 farmers, 2500 acres (2008)	Individual contracts. Among the oldest firms in the region. On an expansion mode to other parts of Tamil Nadu.
Poultry	Coimbatore, Dindigul, Erode	Private limited company	Broiler and Layer, trades in domestic wholesale market, firm owns retail brands and outlets as well.	Local market, mix of traditional traders and other integrators	500 growers (2009)	Operations nationwide, touted as largest poultry integrator in Asia
Papaya	Coimbatore, Erode, Dindigul	Sole proprietorship	Papaya used for papain extraction; fruit is paid for separately, pulp is sold to juicers domestically	No direct competition from other firms, local market is tiny and for an alternative variety	2000 acres; 500-600 farmers (2008)	Individual contracts. Price fixed for latex and fruit. Skilled labor for latex extraction supplied by the firm, although farmers pay for the labor. In 2008-09, mealy bug and ring spot virus epidemic have destroyed crop.

Chapter 7

Safe Gambles? Farmer Perceptions of Risk-return Tradeoffs and Contracting Decisions

7.1 Introduction

Contract farming is often regarded as possessing multiple advantages for farmers in resource-poor developing countries. Specifically, when such an arrangement involves production support from the firm through the supply of inputs, credit, technical advice, etc., it can potentially solve, at once, many missing market problems for participating farmers. In addition, buyback commitments at pre-agreed prices implicitly protect farmers from price risk. Contracting can thus bring about greater transactional certainty and reduced transactions costs in many agrarian settings. Even as these are valid, empirical evidence suggests that contracting is sometimes associated with high risks and uncertainties for farmers involved in such arrangements. In particular, it could potentially leave a contracting farmer exposed to certain catastrophic risks, even while simultaneously insuring farmers against certain other kinds of risk. A firm could, for instance, offer a fixed price for the produce but renege on the commitment to buyback produce. This acquires particular importance when the enforcement of firms' contractual commitments is weak so that farmers are rendered vulnerable within the contractual relationship.

The motivation for this chapter stems from this latter counter-premise, that a contract farming arrangement in a developing country context, rather than being an insurance mechanism for the farmer, is instead akin to a new technology that comes with its own attendant risks.[1] This study suggests then that if contract farming arrangements mitigate many risks but bring others in their wake, farmers must make more complex assessments of the relative returns, benefits and risks associated with contracting before making decisions on whether or not to contract. In other words, contracting decisions of farmers are driven not by a unidimensional preference for protection from

[1]For a more general view of markets themselves as technologies, see Barrett (2008).

a generalized notion of risk but by subjective evaluations of multidimensional attributes involving multiple sources of risk and uncertainty.

Participation in contract farming schemes can therefore be regarded as a matching problem, so that although contracting firms have the final say on farmer selection, the pool of farmers available for contracting is determined in the first place by farmers' willingness to contract.[2] From a policy perspective, this view implies that the degree to which contract farming can take root depends significantly on farmer perceptions of contract farming arrangements. Too often, contract farming arrangements are regarded as unambiguously welfare-enhancing. Viewed simplistically, revealed preference theory suggests that farmers only ever agree to participate in a contracting scheme if they expect, on an average, to benefit from the arrangement. A chief theoretical result that underwrites this viewpoint presumes that risk-neutral firms, possessing a greater capacity for risk-bearing, are able to insure risk averse farmers through contracts, thus generating gains from transacting. Explanations for difficulties in scaling up contracting arrangements or uptake are then assessed within this frame of reference.

The high mortality rate of contract farming schemes in developing countries suggests otherwise. In particular, it indicates that these contractual arrangements perhaps themselves carry elements that trigger disadoption or prevent uptake, which could influence the trajectory of institutional evolution in important ways.[3] There is also the oft-neglected issue of catastrophic risk, when events trigger an implosion of existing schemes. These could emanate from discrete changes in downstream markets that force contracting firms to alter procurement practices or production processes dramatically and often suddenly.[4] Alternatively, the source of such risks could be more local, in the sense that a particular firm fails to honor the contract due to strategic overcontracting

[2]Chapter 8 discusses the notion of selection and outcomes of this matching in detail. This chapter focuses exclusively on mapping farmers' perceptions of contracting and its next best alternative, drawing insights from the theoretical model of a farmer's contracting problem discussed in Chapter 4.

[3]Empirical literature on technology adoption typically assumes that a given technology is beneficial (Foster and Rosenzweig, 1996). Disadoption is less frequently studied. Theoretical work using the property rights approach, described in Chapter 3, offers greater scope for incorporating technologies with ambivalent impacts, but its empirical applications in the area of contract farming have been few. Barrett et al. (2010) cite instances of such farmer exit from modern supply chains, others instances of churning are reviewed in Reardon et al. (2009) and Reardon and Timmer (2005)

[4]For example, Fold and Gough (2008) discuss how varietal preferences of consumers in Europe impacted pineapple contract arrangements in Ghana. Ashraf et al. (2009) documents a breakdown of a contracting scheme in Kenya.

or rejects produce arbitrarily for the same reason. Despite its enormous implications, this aspect has been largely left out of rigorous empirical work on contract farming.

A central goal of this chapter is to examine if the claims implied by this viewpoint hold: Is contracting in a developing country setting itself a gamble pretty much like the alternative spot market? If this is correct, to what extent is it a safe gamble relative to the alternatives available to a farmer? How does the heterogeneity of farmer perceptions of relative risks between contracting and its alternatives match up with contracting status? Relatedly, might the perceived relative costs of risks induce certain farmers, especially those who are risk averse, to opt out of contract farming schemes even if there might be perceived benefits of contracting, i.e., high mean returns associated with contract farming coexists with a high risk associated with such returns?

This chapter is organized as follows. Following this introduction, I explore the rationale for investigating farmer expectations and perceptions of risk. I then elaborate on the multidimensional aspects of risk with contracting in general, and discuss the structure of risks for five specific contract farming schemes in India that form the basis of this study. Thereafter, I describe the methods used in the field survey for eliciting farmer perceptions, before I present an analysis of farmers' perceptions of returns and other risks associated with contracting and the next best alternative, illustrating that contrary to popular perception, contracting is less of an insurance mechanism and itself contributes to variations in incomes not unlike the alternative arrangement it seeks to or does, in fact, replace.

7.2 The Structure of Risks and Metrics

7.2.1 Assessing Risk and Uncertainty

Traditionally, risk in agrarian contexts has been articulated in terms of risk preferences (Binswanger, 1980; Dillon and Scandizzo, 1978; Moscardi, 1977). The emphasis was typically on objective risk, with differences in decisions across farmers being attributed to difference in risk aversion or attitudes toward risk. More recently, there is increasing recognition that perceptions of risk matter a great deal, so that economic decisions involving uncertainty are shaped not just by risk preferences but

by interpersonal and intertemporal variation in subjective assessments of conditional distributions of relevant outcomes. In short, differences in preferences for risky alternatives are associated with differences in perceptions of the relative risk of choice options, and not only with differences in preferences (De Weerdt, 2005; Delavande et al., 2009; Gine et al., 2008; Slovic, 1987; Weber and Milliman, 1997).

The usefulness of eliciting subjective expectations cannot be underestimated (Anderson et al., 1977; Dominitz and Manski, 1996b,a). For instance, there is an old but relatively brief tradition of this in agricultural economics, which finds that farmers' cropping decisions and land allocation patterns are consistent with their yield and returns expectation (Grisley and Kellogg, 1983; Goodwin et al., 1980; Herath et al., 1982; Smith and Mandac, 1995; Botha and Meiring, 1999). Norris and Kramer (1990) provide a review of this tradition.

There is now resurgent interest in collecting subjective probabilities and elicitation of expectations in surveys, partly prompted by recent advances in behavioral economics. Manski (2004) demonstrates that preferences and expectations are often consistent with observed data for a whole range of applications. Nyarko and Schotter (2002) report, using experimental techniques, that the beliefs they elicit from participants do a better job of explaining choices that those that come from three common belief formation models.

To the extent that perceived risk and not actual risk determines economic behavior, risk perceptions obtained through surveys have important informational content for data analysis. Delavande et al. (2009) and De Weerdt (2005) make a strong case for the measurement of subjective expectations, arguing that notwithstanding methodological caveats, they provide important information and are easy enough to collect in developing country contexts. As Smith et al. (2001) explain, subjective risk perceptions are valuable since they incorporate multiple factors, including the individual's understanding of the objective risks, the individual's expectations about his or her own exposure to risks, and his or her ability to mitigate (ex ante) or cope (ex post) with the adverse events if they occur. Recent studies have used measures of risk perceptions both as explanatory factors to analyze economic decisions and as dependent variables to investigate the formation of these perceptions. A number of them use subjective expectations in the context of agriculture and

livestock (Bellemare, 2009; De Mel et al., 2008; Delavande, 2005; Delavande et al., 2009; Doss et al., 2008; Gine and Klonner, 2005; Gine et al., 2008; Lybbert and Barrett, 2007; Smith et al., 2001, 2000).

The approach adopted in this study draws on this tradition that suggests eliciting subjective probabilities and expectations regarding uncertain events can contribute to explaining economic decisions. The formation of these perceptions is not within the scope of this study and is hence not addressed.

At the outset, it is important to clarify the concepts of risk and uncertainty as used in this study. Since Knight (1921), it is common to treat risk as random events to which mathematical probabilities of occurrences can be assigned and uncertainty as pertaining to random events to which mathematical probabilities cannot be assigned, with the latter, known as Knightian uncertainty. I assume that agents who make decisions are able to assign subjective probabilities to all random events when making decisions, or declare their inability to do so based on their lack of knowledge that might form the basis of these assessments. The study's focus is on a collection of attributes that represents aspects of uncertainty associated with contracting and not contracting. Since these attributes are associated with uncertainties, they contribute to value assessments that farmers make for these choices depending on whether they have a negative impact or a positive impact on their well-being. Like Smith et al. (2001) this study then sees risk as denoting a conjunction of uncertainty and adversity. In other words, these attributes, representing different source of uncertainty, can be either risk exacerbating or risk mitigating.

In the following part, I lay out the architecture of these attributes of uncertainty and their potential influence on risk exposure as perceived by the farmers and describe the method used in the field survey to measure farmer perceptions of these.

7.2.2 What contract farming insures and what it does not

In general, elements of contract farming practice can contribute either to reducing risks associated with production and marketing or to increasing them relative to the farmer's alternative to contracting. It is not unusual for both phenomena to coexist, so that a contract farming

arrangement might reduce risks with respect to some aspects while simultaneously introducing or exacerbating those on other fronts. Empirical work on contract farming demonstrate this amply.

A number of studies show that participation in these schemes holds a number of advantages for the farmer, such as availability of inputs in a timely manner of reliable quality and technical advice that contributes to increased and more stable yields (da Silva, 2005; Eaton and Shepherd, 2001; Minot, 2008; Gulati et al., 2008).[5] Farmgate collection of produce and delivery of essential inputs reduce transactions costs and time significantly, which can otherwise be substantial in developing countries. Having an assured buyer who will pick the produce at a pre-agreed price simplifies selling decisions, obviating the need to negotiate a transaction. Contract farming schemes are known to have protected farmers, with a large part of the price risk being transferred to the firm that might possess a greater capacity to bear such risks (Knoeber and Thurman, 1995; Bellemare, 2010; Ramaswami et al., 2005, for example). Each of these aspects is typically rendered variable if the farmer chooses to produce for the open market, although in traditional settings, the farmer might be able to rely on a network of known traders and input dealers.

Emerging empirical evidence suggests, on the other hand, that while contracting with a firm for inputs/outputs mitigates some risks for the farmer, it entails its own set of risks (da Silva, 2005).[6] From the point of view of the farmer, moral hazard arises primarily from the fact that the firm could reject their delivery on grounds of poor quality, timing, etc., attributes that are typically left unspecified in the contract or arbitrarily enforced. This is particularly the case when the firm, which needs a minimum procurement volume (say, to run a processing plant to its desired capacity) might also contract more quantity than they need, as a buffer against production risk or farmer default. This rejection at the factory or farm gate has been cited as one of the most contentious aspects of the farm-firm relationship (Echanove and Steffen, 2005; Glover, 1987; Mannon, 2005). There have been documented instances of firms setting quality standards arbitrarily, becoming inexplicably stringent if spot market prices collapsed, indicating ample supply available from alternate suppliers. Sometimes, farmers have also had to bear the brunt of poor technical assistance, even plain cheating

[5] This literature is surveyed in Chapter 2 and recollected here.

[6] As discussed in Chapter 3, this makes the case for treating contract farming between farmer and firm as an institution with two-sided risk.

and deliberate default (Glover, 1987; Ramaswami et al., 2005). Additionally, the farmer might also evaluate the risk that the firm might not return the next season to contract. This is important, for instance, when the farmer would not want to sever the long-term relationship (s)he has with the village broker or trader. There could be other perhaps longer term risks as well, such as ecological damage or adverse health impacts on account of particular production processes and so forth (da Silva, 2005; Pomareda, 2006).

Which risks are mitigated for the farmer and which ones are exacerbated depends crucially on the precise nature of the contract farming arrangement and is hence essentially an empirical question.[7] The contract farming schemes I study operate in rainfed agricultural areas in the southern Indian state of Tamil Nadu and have diverse arrangements with farmers. The details of the schemes are described in Chapter 6 and hence not invoked here, barring salient operational aspects relevant to the discussion.

In many ways, the five schemes are fairly typical of contract production arrangements elsewhere in the developing world. All contract commodities are cash crops and involve production processes that require farmers to respond continuously to the need to maintain quality. Firms engaged in contract farming thus engage actively in the production process, not only providing critical inputs but also maintaining close supervision from sowing through to harvest and post-harvest handling.

The commodities and firms selected for study represent varying degrees of involvement by the firm in the production process or intensity of contractual relationship. The cotton firm brings in a third-party input manufacturer to monitor and advise farmers, arranging for credit from a nationalized bank and providing materials to store the harvested cotton. The mill's role is confined to coordination and oversight of operations. The gherkins firm provides farm inputs (seeds, fertilizers and pesticides) on credit; this is later recovered from the farmers at the time of harvest, when farmers are paid for the produce, net of input costs. Field officers on the company's rolls monitor crop health and advise farmers periodically. Broiler represents even higher relationship intensity with the firm's officials visiting contract growers every day to monitor health and status

[7] The theoretical literature on contracting offers ways of understanding how existing risks are distributed in different ways across contracting parties, along the lines of Eswaran and Kotwal (1983), for example. There is less theoretical work admitting the possibility of new risks that might be borne exclusively by one party.

of the birds. These firms provide day old chicks to the farm and have detailed protocols for the feed mix and vaccination schedules. For papaya, the involvement of the firm varies over the life cycle of the crop. In the nursery stage, field officials monitor the crop closely with daily visits and once the plant matures into the flowering stage, there is limited oversight, unless the situation demands it. In papaya, an interesting feature is that labor for latex extraction is organized and trained by the firm, with the wages being borne by the farmer. Latex extraction requires great skill and the firm believes it can ensure quality and supply of latex for the plant by maintaining a pool of trained workers, who extract latex on contract farms. Marigold represents the least participation of the firm in the production process, related partly to fewer quality requirements that need only modest supervision. In fact, the marigold firm suggests that monitoring is required more for contract enforcement rather than for production under contract. The marigold firm thus restricts itself to providing high quality seeds at subsidized prices and training new contract farmers in the cultivation practice for marigold. Its field officials advise farmers periodically on pest and disease control. Across the schemes there is heterogeneity in the way risks are distributed between firm and farmers, although they do share many features, such as provision of some critical inputs, technical advice and an agreement to buy back at the end of the season.

There is a priori reason to believe that the revenue for the farmer from contracting is, by design, a stochastic variable. This arises both from yield variability and on account of price structures. A shared feature across the commodities in the study is the firms' practice of contracting for acreage rather than quantities, implying that the firm takes on yield risk.[8] Interviews with agribusinesses suggest that contracting acreage is more acceptable to the farmer especially in the case of crops such as gherkins, with which the farmer might not be familiar. Even with the others, in the absence of easy access to crop insurance, a widespread perception is that exposing farmers to yield risk would undermine the relationship the firm has with farmers. Once contract acreage is agreed upon, contracting firms then provide farmers with as many seeds as is technically recommended for optimal yields on the contracted area. The understanding then is that farmers sell the entire crop from the contracted area to the firm. While this implies that the firm faces uncertain contractual delivery

[8]For broiler, the size of the shed sets the scale of contracting and firms allot birds so that there is one bird for one or 1.2 square feet of shed space.

volumes from a given contractee, equally, it implies that for farmers, revenues from contracting a particular acreage could vary with yields. The yield is both naturally variable and related to the effort and ability of the individual farmer. So this introduces some stochasticity in the revenue stream from contracting. Further, contracted produce is accepted by the firms only if it meets certain established though not necessarily measurable standards. For a farmer accustomed to a less discerning buyer in the traditional channel, this could compound the uncertainty associated with delivered volumes.

As far as the price is concerned, the belief that contract farming, by fixing a price, reduces price risk is valid only in a limited sense. For instance, cotton contract price is a mark up on a reference wholesale market price and hence fluctuates along with the market price. Further, it is not unusual for price to be tied to some measure of quality or benchmark. Often, this implies that price is rendered dependent on farmer effort or on factors beyond his or her control.

While returns to contracting are potentially stochastic, there are other risks farmers might associate with contracting. It is important to note that some are pre-existing risks (or risks shared across modes of operation, contracting and not contracting) that continue to be borne by the farmer. Others are new risks that come with contracting. Some risks are somewhat long-term. for instance, the effects of contract inputs on human health and soil quality, whereas others are immediate. Further, risks could be one-off, like losing title to land, or they could be recurring risks, risks that occur each season the farmer contracts. For instance, in each contracting season there is a perceived possibility that the firm does not turn up to collect the harvest. This is potentially a critical risk when there exists no alternative domestic market for the contract commodity. If the firm does evacuate contracted produce, there is always a chance that the product is downgraded on the basis of quality checks that are not always transparent, price might be discounted, and so on.

In the balance, only a subset of these risks is reflected in the farmers' subjective distributions of returns. Other risks that are more difficult to translate into monetary terms also figure prominently in the farmers' 'mental model' of contract farming and could potentially exert a powerful influence on decision to contract. Quite apart from this, for farmers, contract farming is part of a larger

set of decisions that are made as part of the farmer's livelihood strategy, for instance, how much exposure to have to markets and how much to provide for one's food needs.[9] There are also other dimensions that are not easily monetized, like the notion of self-respect and independence that drives farmer decisions (Key, 2005).

Given the nature of risks and to be able to address the particular concerns of this work I use a combination of two approaches to record farmers' subjective assessments of these risks. The first involves elicitation of entire subjective distributions of net returns associated with contracting and not contracting and the second comprises a psychometric mapping and measurement of other uncertainties or risks that farmers might find difficult to assign monetary values to and hence might not be easy to incorporate in assessment of returns distributions.

Eliciting Subjective Distributions

The first approach entails eliciting the subjective distributions of the farmer with respect to yield, price and net profit, wherever possible, under contracting and for an appropriate alternative. The appropriate alternative refers to the farmer's articulation of what (s)he considered as the next best alternative course of action, were the contracting option not available to them. This is characterized as either growing the contract crop for another firm or the open market or switching to a competing crop.[10] As part of the survey, farmers were asked about the benefits associated with their actual choice and the benefits from the alternative the farmer did not choose. The aim is to compare the benefits from the farmer's choice (of contracting or not contracting) relative to the other option, had it been available. This was asked of four classes of farmers, those currently contracting, former

[9]Echanove Huacuja (2003); Echanove and Steffen (2005), for instance, provide instances where farmers in Mexico try to minimize their risks by planting vegetables for two different companies and, on occasion, cultivating produce for the national fresh market.

[10]This pertains to questions 21, 23, 10 and 9 and in the questionnaires for each type of farmer, Contract Farmer (for the subject firm, also referred to as Subject Contract Farmer), Other Contract Farmer (contract with other firm or spot market if relevant), Attrition Farmers and Never Contract Farmers, respectively, in Schedules 1(A), 1(B), 1(C) and 1(D) found in Appendix C. In the survey, almost all farmers named a single crop as the alternative to the contract crop. Where there were multiple competing crops, they were able to pick one that was the closest substitute for the contract crop. Only in a couple of cases, the farmers suggested that they would leave the land fallow, in which case there exists no alternative distribution. The returns distribution associated with the alternative was treated as being degenerate at zero. Given the typically small size of contracted acreage, the possibility of the contract acreage being assigned to multiple crops contemporaneously did not arise.

contract farmers, those contracting for other firms or cultivating for open market, and those who have never contracted.[11]

The survey thus collected six subjective distributions for each farmer : yield, price and net returns, each for the contract crop under contracting and the alternative option as chosen by the farmer.[12] The returns here refer to net profit per acre per season (net profit per cycle for broiler) of the contract or alternate crop and refer to the income earned minus all paid out costs. Unpaid inputs are not factored in and fixed costs were not apportioned. Farmers were simply asked for the net income they were left with per unit area of production at the end of the season, after paying out all production and transactions costs for the entire season, including multiple harvests. This seemed to be a reasonable, though admittedly not the only, basis for assessing farmers' evaluations of alternatives. Farmers typically clarified that these net profit assessments factored in a subset of risks associated with the marketing channel like price discounts and rejection of quality, etc., so that there is some overlap of the attributes accounted for in the two approaches. It must be noted that the subjective distributions were obtained with specific reference to the particular firm sampled or the trader or firm they were transacting with at that time and not any representative firm or abstract notion of contracting. This is essential if it is to relate to participation and contracting status, given the heterogeneity of firms and practices.[13]

In general, the minimum, modal and maximum value of expected outcomes were elicited through the survey and the farmers were then asked to assign 20 stones as weights to each of these three points, reflecting the expected relative frequencies of the outcomes. These serve as the subjective probabilities at the minimum, mode and maximum values.[14]

Despite the usefulness of such elicitation techniques, these are not without problems, being very

[11]See Appendix A for sampling details. The sample was typically drawn from a census of cultivators in the villages, themselves drawn from a stratified sample based on contracting status.

[12]This pertains to questions 19 and 22 for 1(A), 21 and 24 for 1(B), 11 and 13 for 1(C), 10 and 12 for 1(D) schedules for the different types of farmers, for the contract commodity and for the next best alternative selected by the farmer.

[13]This is to suggest that a farmer's perception of contracting with firm A need not be identical to the farmer's perception of contracting with firm B even if the salient aspects of contracting, price and quality are exactly alike, that there might be non-contractual elements that drive farmers to prefer contracting with one firm rather than the other.

[14]In practice, it was not easy to implement this procedure literally and farmers frequently preferred to assign frequencies verbally. Some even expressed their desire to assign fractions of points which the number of stones would not allow them to do. The relevant questions that elicit these for price, yield and net returns are 19 and 22 for 1(A), 21 and 24 for 1(B), 11 and 13 for 1(C), 10 and 12 for 1(D).

sensitive to the way questions are posed and also the context of heuristic biases, among other things (De Weerdt, 2005; Delavande et al., 2009). To illustrate, all three subjective distributions (price, yield and net returns) were not possible for all cases. For gherkins, for instance, because contract pricing is a schedule of prices related to size of output, farmers had difficulties in articulating a single (average, effective) price. Similarly, the heuristic of availability, or rather the lack of it, was at work for farmers who had never contracted. Having never experienced contracting themselves, and having little vicarious knowledge of this option, the idea of contracting seemed too remote to be able to articulate their expectations regarding returns, yield and price. This data 'gap' however itself carries information in the sense that lack of information of options (and the related absence of subjective assessments) might influence farmer choices.

Another potentially important problem is the self-confirmation bias, where farmers articulate expectations that affirm the choices they have made because affirmation is desired for its own sake. In this study, since the farmer makes repeated decisions on whether to contract or not, the issue of self-confirmation bias is reduced to the extent that farmers get repeated opportunities to reassess their choice afresh at each decision point. Indeed, if we admit that farmers learn in a dynamic setting, the problem of self-confirmation bias seems less of a concern. Another way I try to deal with this is to frame the question in terms of a longer time horizon, implicitly urging farmers to 'span out' before revealing their expectations.[15] I did not ask ex post about a choice they made ex ante, which would make it hard to distinguish between regret over a stochastic outcome and regret for a poor decision. I also place this set of questions before discussing their recent experience or the immediate plans so as not to anchor their responses in time.[16]

For analysis, I use mainly the subjective distributions of returns or the net profit per acre. Given that both price and yield are stochastic, the focus on the measure for net returns that have

[15]The question, translated from Tamil, reads: "If you were to follow the same set of procedures, with the same firm and field officer, under the same contractual terms and assuming the general conditions in your family, village and weather are unchanged, out of 20 seasons growing the contract crop in a plot of your choice, which has the same qualities, what is the number of occasions you would attain the minimum/ the most likely / the maximum price/yield/net income per acre of the commodity?"

[16]I necessarily assume that these subjective distributions are somewhat stable, i.e., they are consistent with the domain being in a frictional equilibrium. This is necessary to be able to relate the data on subjective distributions to contracting status in the most recent season. If the subjective distribution is influenced disproportionately by the most recent experience, then these expectations might be more closely related to contracting status for the season that follows rather than the season just passed. To an extent this problem is addressed by the question's time horizon.

been directly elicited presumably accounts for any potential covariance between price and yield, making it a more reliable indicator. Data on subjective returns to contracting versus the next best alternative for each respondent enables me to compare, at the farmer level, the moments of these distributions as well as the comparison of the entire distribution using stochastic dominance techniques, again for each farmer. In general, it makes more sense to compare these distributions for each farmer rather than across farmer categories. This is owing to the significant differences in alternatives available to farmers both across regions and schemes so that the moments, say, the mean net return for alternatives, averaged over farmers, requires careful interpretation.[17]

Mapping of Risks

The second component of elicitation is mapping a comprehensive list of attributes that can either contribute to increasing or decreasing risk associated with a contracting or its alternative. This roster of attributes was assembled in the course of the pilot survey as the collection of all possible attributes listed or mentioned by farmers in a series of open-ended questions about the relative merits and demerits they saw in contracting versus not contracting. These attributes are listed in Table 7.1. Some of these risks could be accounted for in farmers' articulation of subjective distributions of price, yield or returns. Attempts to focus on only those risks that are unlikely to be factored into the farmer's calculation of subjective net returns were difficult. For example, a farmer who felt the firm's poor quality of inputs often ended up factoring this into his or her response on subjective yield and net returns distributions while also mentioning it as a valid concern in the open-ended listing of risks. In practice, therefore it was not possible to account for these overlaps. So these are necessarily coarse measures.However, the farmer was asked to state his/her

[17]In general, the units and crop duration of the alternatives varies from the contract commodity. In the survey, these have been harmonized over units and time frame for each scheme to make them comparable. For example, for papaya, the return to contracting was expressed as income per month since it is from a crop which lasts for three years, whereas the alternative crop would be a three month crop - the net return for which is converted to the equivalent for a month. In general, the gestation period for crops was not considered. Effectively, the comparison is only for a window when the contract crop or its alternative is generating a return. It must be noted that the yield can vary over the life of a crop and these subjective returns are not adjusted for the age of tree crops. This is less of a concern because these returns were elicited from farmers for conditions that were held similar across the 20 'times'.

expectations under 'regular' conditions, so that catastrophic occurrences are likely not incorporated in the net returns distributions.[18]

The superset of attributes formed the basis for the final survey of farmers in the form of a list of risk-attenuating and risk-enhancing attributes that farmers associate with contracting and its next-best alternative.[19] The questions themselves were open ended, however, so that the relevant attribute is checked off on the list based on the farmer's unprompted listing of these. The roster was meant merely to assist investigators clarify or code the responses. [20]

Given the multiple nature of risks and their varying impact, the relative importance of several sources of risk is not clear. This poses a significant challenge for measurement. Many researchers have now begun to ask about the extent to which an individual perceives him or herself to be at risk. One way to measure risk perception is to ask people an intensity measure with regard to a specific risk (Kohler et al., 2007); another is to get a ranking of the relative importance of different risks(Doss et al., 2008; Smith et al., 2001). Aggregating these measures into reliable indices can however be tricky especially when one wishes to compare measures across individuals. As Smith et al. (2001) illustrate, ranking the importance of an attribute as the second most important among three concerns could potentially be very different from a case where the attribute is ranked second among ten such attributes.

To avoid this problem, the survey uses psychometric measures of perceptions on cardinal scales. Once a farmer identifies a particular attribute as either risk mitigating or risk enhancing, the farmer

[18]For example, some risks such as the firm not showing up to collect the produce or a complete loss of crop on account of pest were not incorporated in the expectations of net returns. For instance, the minimum expected net return was rarely close to 0 and never negative.Chapter 9 shows the range of these elicitation.

[19]The relevant portions of the questionnaires that elicit these responses are 20 and 23 for 1(A), 22 and 25 for 1(B), 12 and 14 for 1(C) and 11 and 13 for 1(D) respectively.

[20]Occasional prompting was required for reticent farmers, who took time to be persuaded that we were not sent by the contracting firm. In most cases, however, no such prompting was required. Whenever the listing of these relevant attributes was sparse, investigators prompted the farmer to ensure that these attributes were truly irrelevant and not a result of a farmer's reluctance to share such information. This was necessary especially for farmers interviewed first in a village. Prompting, as a rule, implied offering a set of attributes from the roster as examples and only in the case of soil fertility and health implications did prompting entail mentioning the risk specifically. In general, farmers in the study area were candid about deeming the prompted risks as irrelevant, if that were indeed the case. For example, in the gherkins area since many farmers voiced a perception that gherkins cultivation affected health, when other farmers who did not mention this risk were prompted, often the response was 'we do not think this is a problem, though in the village many women have experienced difficulties after working on the gherkins fields'. That said, it is difficult to gauge precisely the effect of prompting on the nature of responses and detailed information on which risk was obtained after or before prompting for each farmer was not recorded as part of the survey.

is asked the frequency of occurrence (that is, the probability of the risk) out of ten occasions and the importance of the risk to their personal sense of well-being on a scale of 0 to 10 (these are akin to weights attached to the risk). These weights were meant to proxy the monetary value of loss that farmers associate with the risk in order to capture the distinction between low probability of high loss versus high probability of low loss.[21]

This approach to collecting perceptions of risk allows me to construct risk scores for individual farmers that factor in their perceptions of the benefits of risk reducing attributes and costs of risk enhancing attributes of contracting and not contracting. The primary motive for this is to be able to see how contracting does relative to not contracting from an individual farmer's perspective and to see if these scores relate in expected ways to contracting status. To do this, all attributes are partitioned into four sets, each representing attributes that increase risks associated with contracting, R^c, increase risk exposure when not contracting, R^{nc}, reduce risk exposure under contracting,P^c, or when not contracting, P^{nc}. An attribute can appear both as a risk reducing and risk enhancing factor. For example, when availability of inputs appears as an attribute, contracting can imply assured availability, so that it would be counted as an attribute in P^c , and it could also be the case that under not contracting, farmers face the risk of not having access to inputs, so that it falls under R^{nc}. A list of these attributes is presented in Table 7.1 and detailed discussion of that is reserved for Section 7.3.2 of this chapter. Here, I outline the method for constructing a simple metric to represent the collection of attributes.

I compute three scores for each farmer, a risk frequency score (R_i^f), a risk criticality score (R_i^g) and a combined risk score (R_i^{fg}). The frequency score weighs the relevant attribute with the frequency of occurrence as stated by the farmer. The criticality score weighs each relevant attribute by a cardinal response of how important the attribute is to the farmers indicated as relevant to farmer i. The combined score weighs each relevant attribute with both the frequency and criticality scale. In this case, a high frequency, low loss risk is treated as equivalent to a low probability high loss risk.

[21]The pilot survey tested the possibility of eliciting monetary values of losses associated with these risks, but owing to sparse and often imprecise data, this was not retained for the final survey. The frequency and criticality of the risk was elicited via questions 20 and 23 for 1(A), 22 and 25 for 1(B), 12 and 14 for 1(C) and 11 and 13 for 1(D).

Denoting $I(r)$ as an indicator variable taking the value 1 if the attribute r is relevant to the individual farmer i and 0 if not, the collection of all attributes r represent the universe of such attributes, i.e., all the possible attributes listed by sample farmers as either contributing to increasing risks or decreasing risks associated with contracting and its alternative. The score is summed within each set of attributes to yield the following structure of scores.

$$R_i^g = (\overbrace{\sum_{r\in R^c} I(r)g_i}^{\text{Risk enhancing}} - \overbrace{\sum_{r\in P^c} I(r)g_i}^{\text{Risk attenuating}}) - (\sum_{r\in R^{nc}} I(r)g_i - \sum_{r\in P^{nc}} I(r)g_i) \tag{7.1}$$

$$R_i^f = (\sum_{r\in R^c} I(r)f_i - \sum_{r\in P^c} I(r)f_i) - (\sum_{r\in R^{nc}} I(r)f_i - \sum_{r\in P^{nc}} I(r)f_i) \tag{7.2}$$

$$R_i^{fg} = \underbrace{(\sum_{r\in R^c} I(r)f_ig_i - \sum_{r\in P^c} I(r)f_ig_i)}_{\text{Net risk score from contracting}} - \underbrace{(\sum_{r\in R^{nc}} I(r)f_ig_i - \sum_{r\in P^{nc}} I(r)f_ig_i)}_{\text{Net risk score from not contracting}} \tag{7.3}$$

$R_i^g, R_i^f R_i^{fg}$ are interpreted as the net incremental risk the farmer associates with contracting. The greater the score, the greater the risks farmers believe they are taking on with contracting, relative to their next best alternative and after factoring in the benefits they associate with contracting. This score does not reflect monetary values though some of the component attributes affect incomes directly.

The score is an absolute measure but is best interpreted in its broader context. The survey identified 22 attributes as belonging to R^c, 14 factors in P^c 13 in R^{nc} and 10 in P^{nc}. A farmer treating every attribute in every set as valid ends up with a risk score of 5. In other words, when a farmer believes that each of the attributes in each set is relevant, that each of it is extremely important to his or her sense of well-being (and hence carry the maximum score 10) and occurs every time the farmer chooses to contract or not contract (with a frequency of 10 out of 10), that farmer would have component scores of 22, 14, 13 and 10 yielding a combined risk score of 5. A farmer who sees none of these attributes as relevant has 0 for each component score and hence a combined net risk score of 0.[22] The greatest incremental risk comes when a farmer associates all 22

[22]The risk scores are cast as differences and not as ratios in order to avoid instances of component scores being 0.

risk enhancing attributes with contracting and believes that all 10 risk mitigating attributes from not contracting as valid. Should the farmer choose contracting the net incremental risk would be 32. This is the maximum risk farmers take on, given the set of risks defined by the sample. The least incremental risk from contracting is associated with a farmer who treats all positive attributes with contracting as relevant and the alternative option is associated only with risk increasing attributes and all the risk increasing attributes. In this case, the net incremental risk a farmer takes on would be -27. This defines the range of possible frequency and risk mitigating scores. The combined net risk score is higher whenever a farmer associates a particular option with either a larger number of risks, a greater criticality of risks or a greater frequency of risks, or combinations of these, *ceteris paribus*.

These risk scores are coarse measures but offer useful tools to make select comparisons across farmer groups distinguished by contracting status. It also offers a tool to map the heterogeneity in the distribution of attributes that operate on risks and uncertainties across different contracting schemes.

7.3 The Stochasticity of Contract Prices and Net Returns from Contracting

With the combination of tools described above, it is now possible to map farmer perceptions of relative risks and returns associated with contracting. For the purpose of this analysis the sample farmers are treated as either contract farmers (implying they could either contract with not just the sample or subject firm but for any other firm) or as non-contract farmers (denoting those who do not currently contract at all).

Subjective distributions of net returns from contracting across farmers and commodity sectors suggest that contracting is indeed a gamble. This is an outcome of the perceived stochasticity of both price and yield by farmers.

The elicitations of subjective distributions of contract price that farmers expect confirm that the notion of fixity of contract prices is only approximately correct. Figure 7.1 plots the coefficient of variation of subjective distributions of contract prices for all the farmers in the survey illustrating

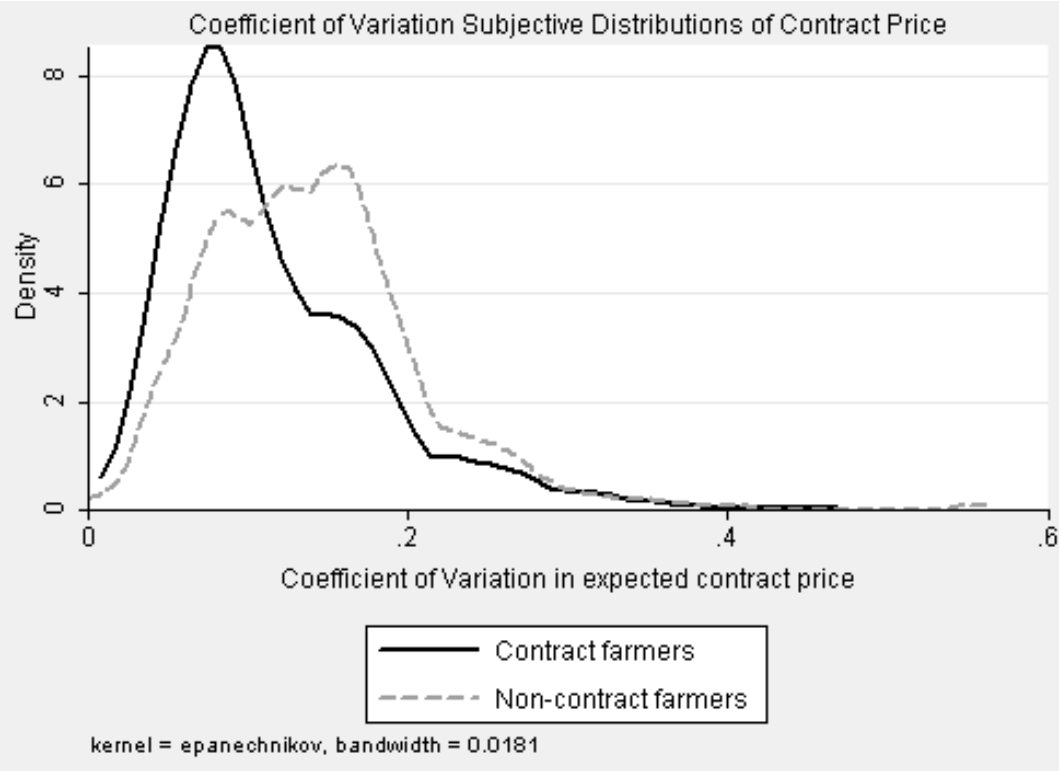
Table 7.1: Risk Enhancing and Risk Attenuating Attributes

Contracting		**Not Contracting**	
14	22	10	13
Risk attenuating factors associated with contracting	Risk exacerbating factors associated with contracting	Risk attenuating factors associated with next best alternative	Risk exacerbating factors associated with next best alternative
P_c	R_c	P_{nc}	R_{nc}
Yield fluctuations	Yield fluctuations	Yield fluctuations	Yield fluctuations
Cash advance for input purchase	Yield fluctuations on account of weather	Transactions time and cost	Yield fluctuations on account of weather
Credit availability	Yield fluctuation on account of pest and disease	Food self-sufficiency	Yield fluctuation on account of pest and disease
Availability of inputs (Seed, fertilizers, pesticides)	Initial investment	Credit availability	Rejection or downgrading quality of produce
Quality of inputs	Rejection or downgrading quality of produce	Can sell anytime, flexibility	Price fluctuations
Availability of technical advice	Firm might not return to contract in the future	Rejection or downgrading quality of produce	Availability of inputs (Seed, fertilizers, pesticides)
Crop duration	Group default	Availability of buyer / known trader	Quality of inputs
Transactions time and cost	Firm may not show up	Self respect	Availability of technical advice
Farmgate collection	Field officials are not trustworthy	Lumspum payments	Quality of technical advice
Availability of buyer/Assured buyer	Impact on health	Timely payments	Transactions time and cost
Price premia	Impact on soil quality		Cash advance for input purchase
Lumspum payments	Fear of losing land		Credit availability
Timely payments	Availability of labor		Payment delays
Sure income	Labor intensity		
Firm bears losses	Input costs		
Administer vaccines	Labor costs		
	Transactions time and cost		
	Quality of technical advice		
	Delayed payments		

[1] These are assembled from the relevant tables in the questionnaires in Appendix C. They are questions 20 and 23 for 1(A), 22 and 25 for 1(B), 12 and 14 for 1(C) and 11 and 13 for 1(D).

the extent of variation in the contract price that farmers expect.[23] It is evident from the kernel density function that far from being a degenerate distribution which would imply zero variation in price, farmers expect to get different contract prices, on account of factors that might be related to quality or due to complex structures of pricing linked to commodity attributes or market price anchors to contract pricing or farmer productivity. The figure suggests too that non-contract farmers are more likely to expect higher variation in contract prices than contract farmers.[24] This shows significant, albeit incomplete price risk reduction from contracting.

Figure 7.1: The Stochasticity of Subjective Contract Prices of Contract and Non-contract farmers



Note: The Kolomogorov-Smirnov test for equality of distributions suggests that with a D-statistic of 0.25, and an associated p-value of 0.00 the null that the two distributions are equal can be rejected at 1% level of significance.
Contract farmers refer to those who contract with any firm, i.e., either the subject or sample firm or any other firm. Non-contract farmers refer to those who do not contract with any firm, these are either farmers who grow for the spot market or are attrition farmers or those who have never contracted.

[23]The coefficient of variation is presented since this enables pooling of data for all commodities. It must be noted here that the data on subjective distribution of contract price is computed only for non-missing observations. Close to eight percent of the respondents across both phases were unable to give complete and consistent distributions for the contract price.

[24]It is worth recalling that non-contract farmers here include farmers who have never contracted, those who have ceased contracting and those growing for the open market. Contract farmers include farmers contracting for either the subject firm or for any other firm.

While individual farmers' subjective expectations of contract price suggest that they may be stochastic, it is instructive that the subjective modal contract price that farmers expect varies widely, despite the fact that these farmers work with the contracting firm on the same contractual terms. They have the same contract but different expectations of price. These figures show the distribution for contract farmers for subject firm alone.

Figures 7.2 for gherkins contract farmers in the two phases shows that the distribution of expected contract price varies widely over the range of contract prices established by the firm for different size categories, indicated by the vertical red dashed lines. This is true of the sample in both phases. In the case of cotton (Figure 7.3), the contractual price is a mark-up on a reference price, which is typically a three-day average of the price prevailing in the wholesale market preceding the stated time of delivery. Farmers expectation of the modal expected contract price varies widely, reflecting perhaps their perception of the variability in market prices that anchor the contract price.[25] The case of papaya and marigold present a contrast since for these two, the objective contract price, as specified in the contract, and the subjective modal contract prices expected by farmers vary only marginally and is shared across farmers (i.e., does not vary across farmers).

In general, it makes sense to think of contract prices as representing an objective price and a subjective price, where the objective price is agreed upon as part of the contract and is conditioned on certain parameters for delivery. The subjective price, meanwhile, is the contract price that farmers expect to get. These are however distinct from what might be called the actual realized contract prices.[26]

Figure 7.3 shows the distribution of prices contract broiler growers actually received at the most recent contractual delivery, so that this is a distribution of contractual prices received across broiler growers. [27] The distribution of realized contract prices on delivery lies to the left of the distribution of subjective modal contract prices. This implies that farmers are either optimistic so that their expectations of the contract price run higher or that this was a disappointing season.

Thus, this comparison reveals that the objective contract price need not necessarily coincide with

[25]These objective prices were obtained from the firms according to the contract specific.
[26]The realized prices were obtained through question 33 in Schedule 1(A).
[27]The vertical line in the figure represents a benchmark price per kilogram of live weight broiler for a feed conversion ratio (FCR) that the firm considers optimal.

the subjective prices that farmers expect to receive in reality, and that this is an important source of variation in expected net returns from contracting that differs across farmers and potentially over time and hence affects a farmer's propensity to contract. Moreover, both objective and subject expected prices may differ from actual realized prices.

The actual price a farmer earns for a given contractual delivery, ore realized price, can therefore be regarded as a draw from a distribution, be it from a farmer specific distribution of prices or from a distribution of prices across farmers. These examples suggest that price under contracting need not necessarily be a degenerate distribution, much less the farmers' subjective expectations of these prices, although the more transparent and rigorous the measures of quality employed, the more certain the price offered for produce.

The stochasticity in farmers' perception of prices combined with yield fluctuations renders the expected net returns from contracting stochastic as well.[28]

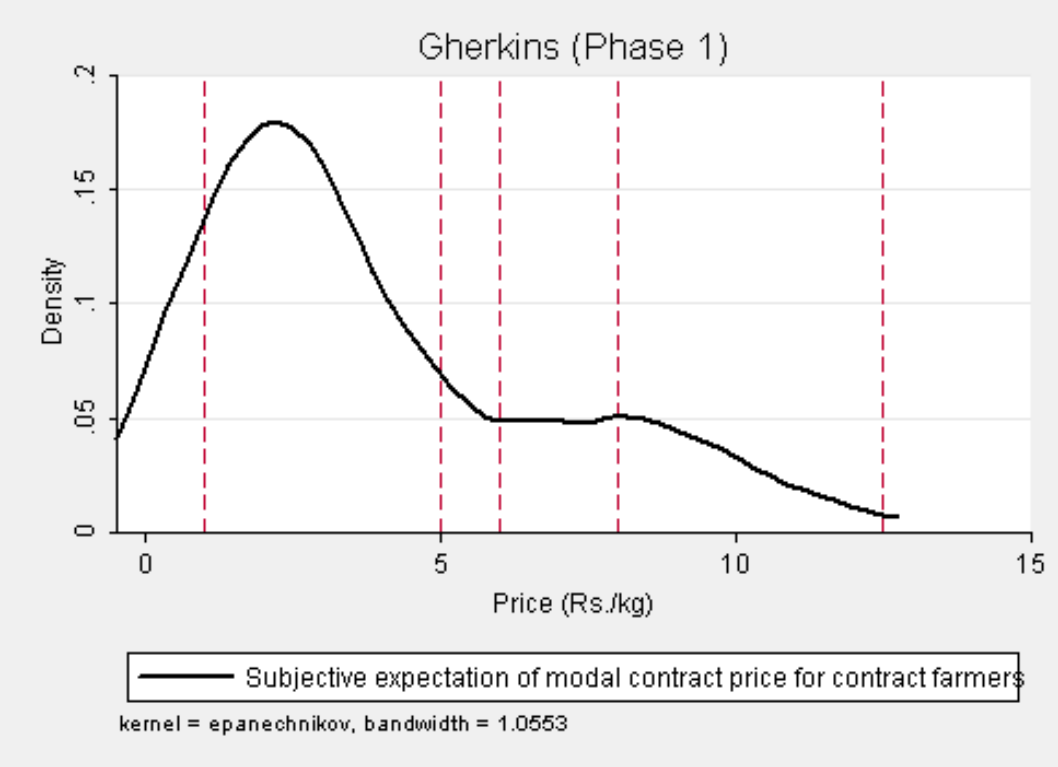
In essence, if contracting is associated with some sort of certainty, it is not in an absolute sense, and not in the realm of net returns. The question is then, if contracting is a gamble, how safe a gamble is it? One way to explore this aspect is to compare, for an individual farmer, the moments of the subjective distributions of net profit per unit area across possible choices. These include mean, coefficient of variation, skewness, kurtosis measures for the subjective distribution from contracting as well as that for the next best alternative. These are expressed in relative terms to facilitate comparison across the self-declared choices. Table 7.2 gives details of these measures as a prelude to subsequent tables.

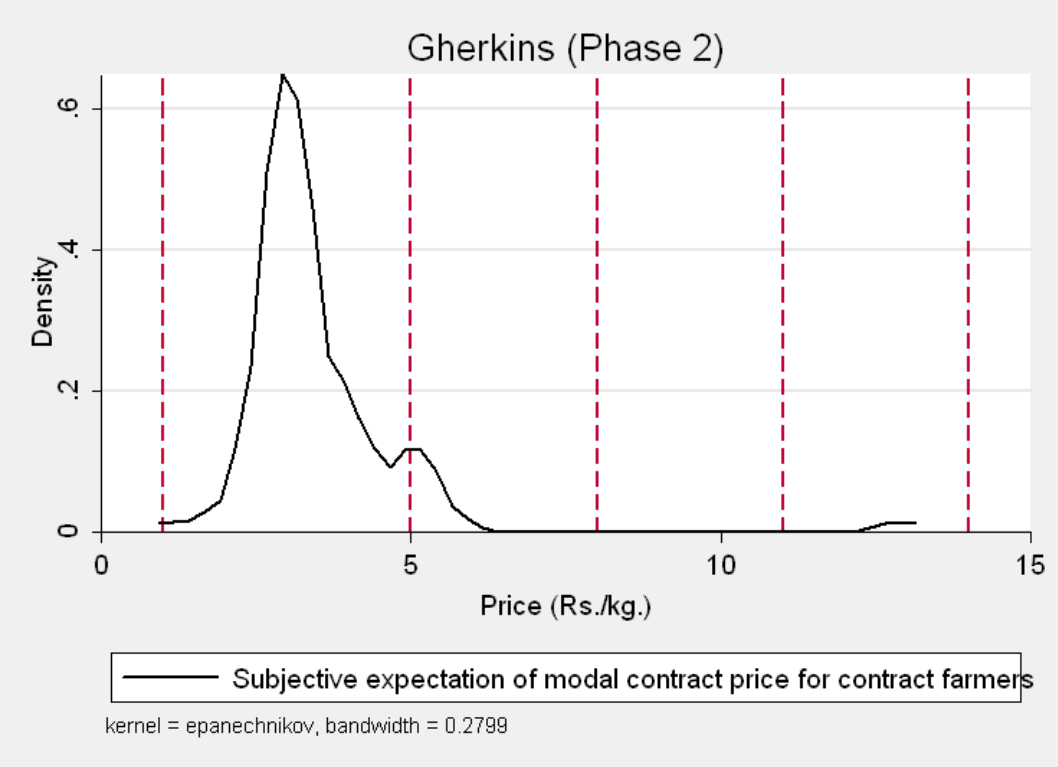
Table 7.3 shows measures reflecting the average relative moments of the subjective distributions of contracting versus the next best alternative for the different contracting schemes and farmer types, distinguished by contracting status.[29] The raw measures of the ratio of relative subjective returns between contracting and the next best alternative suggest that contracting in gherkins, cotton and papaya is associated with higher mean returns, irrespective of farmer type, i.e., whether

[28]The issue of yield fluctuation is not addressed here since not contracting is often associated with not growing the contract commodity making yield comparisons difficult.

[29]For this part of the analysis, the farmer types are disaggregated so that there are Subject Contract Farmers (who contract with the subject firm), Other Contract Farmers (who contract with any other firm, Attrition Farmers and Never Contract Farmers.

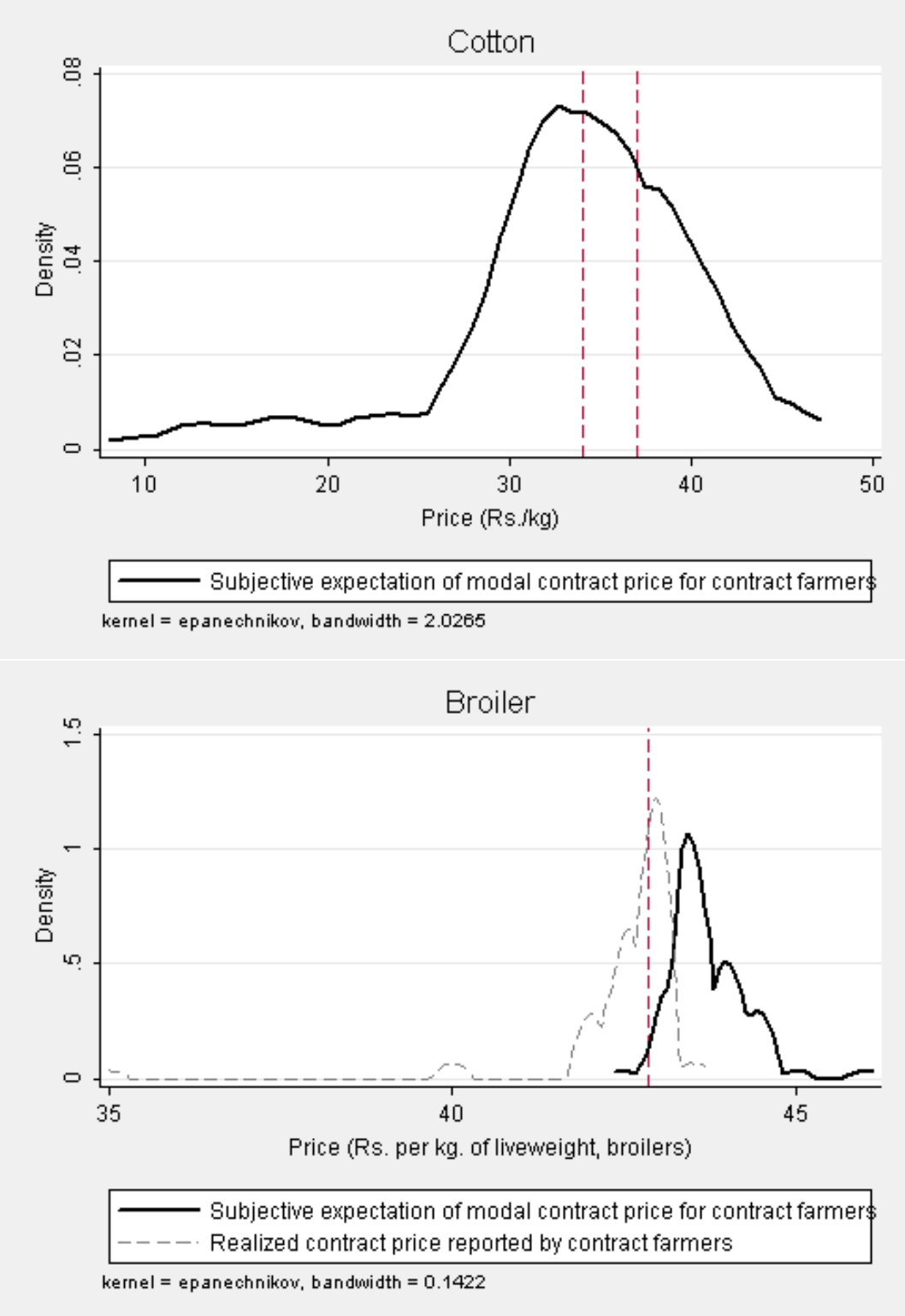
Figure 7.2: Subjective Modal and Objective Contract Prices of Subject Contract farmers





Note:The contract farmers include farmers who contract with the sample firm. Vertical dashed lines represents the objective price obtained from the contracting firms.

Figure 7.3: Subjective Modal and Objective Contract Prices compared with Actual Realized Prices for Subject Contract farmers



Note: The contract farmers include farmers who contract with the sample firm.Vertical dashed lines represents the objective price obtained from the contracting firms.

they are currently contracting, have exited the arrangement or have never contracted. Tellingly, however, farmers tend to associate contracting not only with a higher mean, but also with higher coefficient of variation, barring cotton farmers who do not contract. This is evident from the ratio of the coefficient of variation in subjective returns between contracting and the next best alternative.

In the case of marigold and broiler, the reverse is true, so that the subjective mean returns from contracting are lower relative to not contracting, except for marigold farmers who do not contract with the sample firm. Marigold farmers however associate contracting with a higher coefficient of variation. Only with broiler are clear indications of contract farming serving as an insurance against risky returns, with contracting associated with a low mean and also a low coefficient of variation relative to the alternative.

Furthermore, higher variability in returns to contracting relative to its alternative, which Table 7.3 suggests is comparable across farmers, might not in itself be a significant factor. Critical is the skewness of the distribution. Contracting protects the farmer from downside price risk by fixing a price. However, this also prevent farmers from exploiting high prices in the next best alternative. Table 7.3 shows the difference in skewness between the expressed returns distribution of contracting and not contracting. Whenever this figure is positive, not contracting allows a greater possibility of higher returns the contracting. In the Farmer Survey, many farmers who choose not to contract suggest that the advantages with the open market is that when prices sometimes shoot up in the open market and by opting to go for a contract crop one loses the opportunity to take advantage of these price spikes, even if they were infrequent occurrences. Marigold farmers, for instance, associate the spot market net profit distributions with a negative skewness, which renders the difference in skewness between contracting and not contracting positive (Table 7.3) indicating relatively larger opportunities of a higher return in the spot market than when contracting. The t-test of difference in means across farmer groups is however not significant for any comparison across farmer groups for marigold. For gherkins (Phase 2) and papaya, the difference in skewness for each group of non-contracting farmers is positive and the figure is statistically significantly less than for contract farmers, in most cases.

Similarly, the difference in kurtosis of subjective distributions of contracting and the next best

alternative imply that a positive figure indicates fatter tails associated with contracting relative as compared with not contracting. In the case of broiler and papaya, the contract farmers, with both the sample firm and other firms, associate contracting with a relatively thinner tail, whereas for those not contracting the opposite is true. This pattern is evident in the gherkins sample from Phase 2.

Inter-group comparisons of the means of these relative moments corroborate this pattern. For gherkins and cotton, there is a statistically significant difference between contract and a subset of non-contract farmers for both mean and coefficient of variation, emphasizing that contract farmers see contracting as a high variance option, but also one that has a higher mean return relative to not contracting. At the other end, for broiler and papaya, the difference between contract and non-contract farmers for the relative mean and coefficient of variation is statistically significant. This signifies that contract farmers for papaya and broilers might be willing to settle for a lower mean return if it is also associated with a lower variance.

Table 7.4 shows, groupwise, the percentage of farmers for whom the subjective returns distribution from contracting stochastically dominates that from the next best alternative. Oddly enough, the tests for a significant difference in proportion indicates that contracting stochastically dominates not contracting for a significantly greater proportion of non-contract farmers than for contract farmers. Where this difference is with respect to the Never Contract Farmers group, as it is for gherkins and papaya, it is plausible that a large proportion of those who have never experienced contracting tend to associate it with a returns distribution that is unambiguously better than not contracting, in part due possibly to inaccurate perceptions in the absence of experience to contract. The weak correspondence of contracting status and stochastic dominance also points to other possible sources of exclusion, either by virtue of having been rationed out by the firm or on account of other concerns that do not readily reflect in returns distributions. The table shows for instance that for those farmers who do not contract but believe that returns from contracting stochastically dominates not contracting, an overwhelming majority stated in the survey that they

Table 7.2: Description of Indicators of Relative Moments for an Individual Farmer

Variable	Computation
Ratio of mean subjective net returns from contracting and next best alternative	$\left[\frac{\mu_c}{\mu_{nc}}\right]_i$ for each farmer i
Ratio of coefficient of variation of subjective net returns	$\left[\frac{\sigma_c}{\overline{X}_c} / \frac{\sigma_{nc}}{\overline{X}_{nc}}\right]_i$ for each farmer i
Difference in skewness in subjective net returns between contracting and next best alternative	$\left[Sk_c - Sk_{nc}\right]_i$ for each farmer i
Difference in kurtosis in subjective net returns between contracting and next best alternative	$\left[K_c - K_{nc}\right]_i$ for each farmer i

[1] These are computed using the elicited returns distributions for each farmer. These are then averaged across farmer types or groups to make intergroup comparisons.

were unlikely to want to contract at any time in the next three years, 72%, 90% and 93% for gherkins (Phase 1), marigold and papaya, respectively.[30]

The data on farmers' subjective returns points to two broad issues. First, farmers are attentive to mean returns from contracting but are likely take into consideration the entire distribution of returns. Second, other attributes that enhance or mitigate risks can exert a reinforcing or countervailing influence on the decision to contract.

If non-contract farmers too associate contracting with higher relative mean returns, and indeed, where subjective returns from contracting first order stochastic dominates not contracting, the question arises as to why many farmers opt not to participate. While one explanation is that they were rationed out by the contracting firm, this is not always the case. Indeed, when those had never contracted were asked whether the firm excluded them or they opted out, the percentage of farmers who had never wanted to contract despite an opportunity to do so was 48% for gherkins, 50% for marigold, 55% and 30% for broiler and papaya respectively.[31] Evidence from the survey bears out the premise that there might exist other overriding concerns for non participation.

To see this, it is useful to superpose risk scores with subjective returns distributions. Figure 7.4 compares the distributions of relative mean returns of contract farmers (irrespective of which

[30] This figure is available for gherkins, for instance, from question 33 and 21 in questionnaires 1(C) and 1(D).
[31] This information is tabulated from question 6 for 1(D).

Table 7.3: Relative Moments of Subjective Distributions of Net returns for Contracting relative to the Next Best Alternative

Commodity and Farmer type	Average of the ratio of mean subjective net returns	t-statistic for equality of means across groups	Average of the ratio of coefficient of variation of subjective returns	t-statistic for equality of means across groups	Average difference in skewness of subjective returns distributions	t-statistic for equality of means across groups	Average difference in kurtosis of subjective returns distribution	t-statistic for equality of means across groups	Number of observations
Gherkins:Phase 1									
Subject Contract Farmers	2.11		1.49		0.01		0.01		40
Other Contract Farmers	1.33	2.96 ***	1.35	0.64	0.12	-0.61	-0.13	0.67	58
Attrition Farmers	1.76	1.04	1.53	-0.17	0.04	-0.11	0.48	-1.85 **	40
Never Contract Farmers	3.61	-0.99	1.12	2.06 **	-0.03	0.2	-0.03	0.16	60
Cotton									
Subject Contract Farmers	1.44		1.20		-0.07		0.01		60
Other Contract Farmers	1.33	0.32	0.65	2.26**	0.12	-0.9	0.25	-0.57	6
Attrition Farmers	1.10	1.29 *	1.37	-0.41	-0.49	1.68 **	-0.64	1.24	32
Never Contract Farmers	1.33	0.28	1.18	0.11	-0.16	0.43	-0.30	0.65	52
Gherkins:Phase 2									
Subject Contract Farmers	3.39		1.46		-0.11		-0.03		54
Other Contract Farmers	2.64	0.88	1.24	1.23	0.09	-1.45 *	0.07	-2.03 **	23
Attrition Farmers	2.83	0.56	1.70	-0.9	0.06	-0.88	0.20	-1.32	18
Never Contract Farmers	3.68	-0.21	1.16	1.74**	0.26	-2.96***	0.08	-1.9 **	21
Marigold									
Subject Contract Farmers	0.85		1.75		0.32		-0.25		59
Other Contract Farmers	1.90	-2.69***	0.90	4.34 ***	0.12	0.73	0.15	-1.1	24
Attrition Farmers	0.76	0.52	1.61	0.55	0.50	-0.61	-0.63	0.91	18
Never Contract Farmers	0.66	1.25	1.59	0.58	0.45	-0.63	-0.36	0.35	20
Papaya									
Subject Contract Farmers	1.33		1.07		-0.06		-0.04		72
Never Contract Farmers	2.72	-2.69 ***	1.35	-1.55 *	0.24	-1.38 *	0.31	-1.37 *	27
Broiler									
Subject Contract Farmers	0.30		0.76		0.13		-0.24		61
Other Contract Farmers	0.26	0.98	0.79	-0.25	0.08	0.38	-0.13	-0.65	10
Attrition Farmers	0.30	0.07	0.92	-1.24	-0.28	2.05 **	0.10	-1.14	10
Never Contract Farmers	0.34	-2.12 **	0.89	-1.96 **	-0.11	3.19 ***	0.01	-1.63*	57

Significance levels : * : 10% ** : 5% *** : 1%

[1] Farmer Survey, Phase 1 and 2,2007-10.
[2] Computations include only those observations for which farmer responses were complete.
[3] The relative moments in ratios pertain to those associated with contracting over the next best alternative. The differences in skewness and kurtosis are those for contracting minus the next best alternative.
[4] The t-statistics are for comparisons of relative moments between contract farmers and each of the other farmer types. Hence, there is no corresponding statistic for contract farmers. The null is that the difference in mean between contract farmers and the other farmer group is zero.
[5] All figures are rounded off to two decimal places.

Table 7.4: Stochastic Dominanace of Net returns for Contracting and the Next Best Alternative for Different Farmer Types

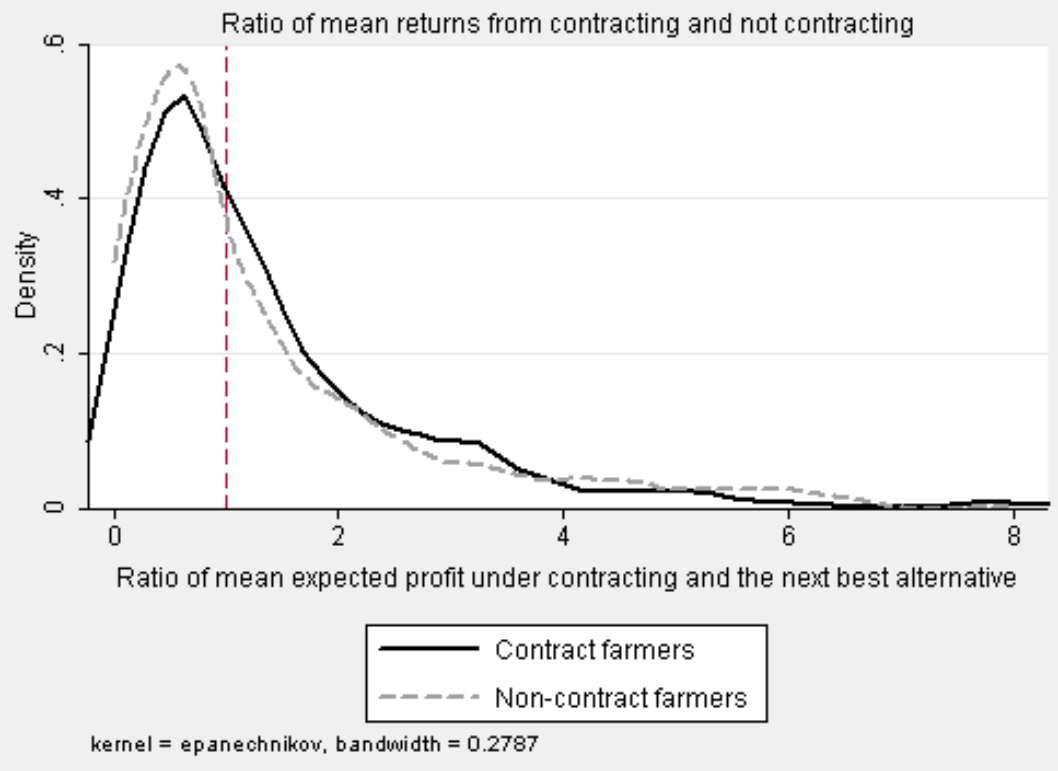
Commodity and Farmer type	Proportion of farmers for whom contracting first-order stochastic dominates the next best alternative	Proportion of these who do not want to contract	Z-statistic for equality of proportion for contract farmers with each farmer type	Proportion of farmers for whom contracting second-order stochastic dominates the next best alternative	Z-statistic for equality of proportion for contract farmers with each farmer type	Number of observations
Gherkins:Phase 1						
Subject Contract Farmers	35			45		40
Other Contract Farmers	26	29%	0.97	33	1.23	58
Attrition Farmers	40	31%	-0.46	45	0	40
Never Contract Farmers	60	72%	-2.45 ***	63	-1.8 **	60
Cotton						
Subject Contract Farmers	28			30		60
Other Contract Farmers	50	100 %	-1.01	50	-1	6
Attrition Farmers	22	57%	0.67	25	0.51	32
Never Contract Farmers	31	81%	-0.28	35	-0.52	52
Gherkins:Phase 2						
Subject Contract Farmers	56			59		54
Other Contract Farmers	65	7%	-0.79	70	-0.85	23
Attrition Farmers	56	50%	0	56	0.28	18
Never Contract Farmers	62	50%	-0.5	71	-0.98	21
Marigold						
Subject Contract Farmers	14			19		59
Other Contract Farmers	42	90%	-2.82***	42	-2.19 ***	24
Attrition Farmers	17	100%	-0.33	17	0.19	18
Never Contract Farmers	5	0%	1.04	10	0.9	20
Papaya						
Subject Contract Farmers	32			36		72
Never Contract Farmers	52	93%	- 1.82**	56	-1.75**	27

Significance levels : ∗ : 10% ∗∗ : 5% ∗ ∗ ∗ : 1%

[1] Farmer Survey, Phase 1 and 2,2007-10.
[2] The computations include only observations for which the responses of farmers regarding subjective distributions is complete.
[3] Broiler farmers are excluded since the proportion of farmers for whom contracting first order stochastically dominates not contracting is zero for all farmer groups.

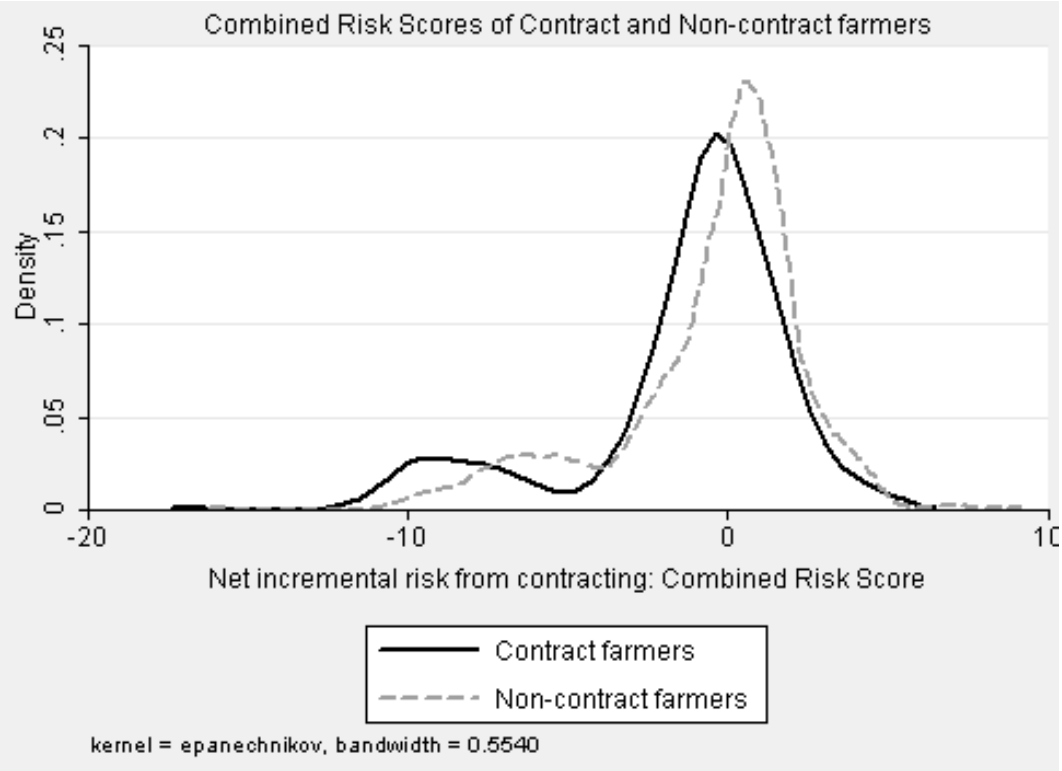
firm they contract with) and non-contract farmers, wherein the distribution of the latter is only marginally more heavily concentrated below one than that of the non-contract farmers. Whereas, the risk scores computed for attributes indicates that non-contract farmers believe they are taking on significantly greater incremental risks with contracting that contract farmers believe is the case. Kolomogorov-Smirnov test for equality of distributions suggests that contract and non-contract farmers do not differ overall in their perceptions of relative returns from contracting versus its next best alternative, but do differ significantly in the perceptions of the relative risks they associate with contracting (Figure 7.5).

Figure 7.4: Contracting and its Alternative: Comparison of Relative Returns



Note: The Kolomogorov-Smirnov test for equality of distributions suggests that with a D-statistic of 0.254, and an associated p-value of 0.20 the null that the two distributions are equal cannot be rejected at even 10% level of significance.

Figure 7.5: Net Incremental Risk from Contracting: Combines Risk Scores for Contract and Non-contract Farmers, 2008-10



Note: The Kolomogorov-Smirnov test for equality of distributions suggests that with a D-statistic of 0.17, and an associated p-value of 0.00 the null that the two distributions are equal can be rejected at 1% level of significance.

7.3.1 Mapping Sources of Risk across Attributes

Anecdotal evidence suggests that regardless of farmer perception of the variation in returns to contracting or in the skewness of these distributions, contracting decisions are often driven by the perception of possibilities of catastrophic risk.

In general, there is much variation across commodities. Table 7.5 shows the average scores by commodity and farmer type for the three measures - the Combined Risk Score, Criticality Risk Score and the Frequency Risk Score. These three measures appear equivalent. Hence, the Combined Risk Score is used as the main indicator of the net incremental risk associated with contracting. Figure 7.6 shows the distribution of the Combined Risk Scores according to commodity and farmer type. It is clear that of the commodities studied, marigold contracting is generally associated very low incremental net risk exposure. Papaya and broiler contracting are associated with relatively moderate net additional risk exposure, with gherkins and cotton occupying the higher end of the combined risk score scale.

This is consistent with the qualitative information collected from the field survey. Even as gherkin is regarded as lucrative and despite the decade long embrace of gherkin, it continues to be an exotic crop grown for the "factories". No local market exists for gherkin and it does not figure in local diets. Many farmers had visited the factories as part of the company's efforts to build confidence of farmers in this new crop. To most farmers the rapid growth of the gherkins crop was a wonder, attributed to the high level of inputs. In fact, across the survey region, the Tamil name for the crop was *visha vellri*, or poison cucumber, a reference to the relatively high level of chemical inputs it required.

It is also clear that gherkin is a highly demanding crop in terms of labor inputs, especially during harvesting. Timely harvesting of produce is critical. This has something to do with the structure of the contract, where small gherkins command a premium over larger ones. Since the gherkins grow rapidly in size, from day to day, in order to get the maximum returns, the farmers need to harvest gherkins "on the day that matters".[32] Any delay could cause a profound dent in the revenues a farmer can get. Farmers opined, for instance, that "even if there is a death in the

[32]Farmer Survey, Phase 1, 2008, Reddiarchatram block, Dindigul district.

house at harvest time, we have to put the body aside until we finish with the gherkins".[33] Many who chose not to contract cite small families and lack of family labor or lack of availability of labor as reasons for not doing so.

Also, women tend not to work on gherkins plots. There is a popular perception among the farming families that the pesticide use in gherkins fields is detrimental to women's reproductive health and causes workers (especially women) to faint. While this is largely unsubstantiated in the sense that there is no independently available scientific evidence on the link between morbidity and pesticide use in the specific context of gherkins cultivation in the study area, the higher incidence of women's health issues in the villages has been enough to keep the women away from working on gherkins fields. This sometimes has an impact on the willingness to contract as well.

Another impression that was shared across villages in one part of the study area is that gherkins cultivation led to deterioration is soil quality. Some farmers claimed that paddy, when it followed gherkins on the same plot, yielded half of what it would otherwise. Some others claimed they changed the top soil layer, when they switched from gherkins to another crop, in order to restore soil quality. As a consequence of soil quality concerns, some farmers participate in episodes, growing gherkin every other year, but not more frequently. Indeed, field officers recommend switching plots and rotating crops to maintain soil fertility.

The riskiness associated with cotton contract farming is quite different in complexion. Cotton is a traditional cash crop in the region, and the firm contracting is well known. Farmers associated cotton contracting with significant benefits. For example, a positive externality from contracting for both cotton (and gherkins, in fact) is the advice farmers got for plant protection for other crops. This has obvious value, against the background of a collapse in state agricultural extension programs. According to most farmers, the field officers advised them against the indiscriminate use of pesticides and that fertilizer application needs to take into account the type of soil. This seemed to be a revelation for the farmers. But this advice also seemed very dependent on who the field officer was. Despite this, the pricing in the cotton contracting scheme is a mark-up on the market price, which exposed farmers to the market price fluctuations the same way as the alternatives for

[33]Farmer Survey, Phase 1, 2008, Natham block, Dindigul district.

the farmer. The quality requirements of the firm for staple length and cotton free from external impurities was considered a problem. Most of all, however, many farmers believed that the firm did not pay on time and discounted prices somewhat arbitrarily. Collectively these rendered cotton contracting a risky proposition relative to the alternative. Most cotton contract farmers suggested that they would opt to grow a competing crop like tomato or chilies, or cotton for the open market. Interestingly, the year of the survey was the last season the cotton firm contracted. It seems that the high risk scores reflected farmer discontent, an important ingredient of the failure of cotton contracting in the region.

In the case of papaya, Table 7.5 suggests that farmers who do not contract associate papaya contract farming with lower risks than do contract farmers. This is likely owing to the particular turn of events during the time of the survey. Papaya contracting had been growing popular across swathes of the study area. Despite requiring a long gestation period, since the trees bear fruit only in the eighth month or so, farmers were content with the arrangement. However, in June 2009, the worldwide epidemic of papaya mealybug reached southern India and the contract papaya fields and farmers in the area lost entire plantations to the pest. Consequently during the survey, virtually all contract farmers expressed risks of pest and consequent yield loss as the most important risk associated with contracting.

Marigold is viewed as bringing on less incremental risk for several reasons. This crop needs low initial investment, it is not too labor demanding and in a region that is fairly remote up in the hills, firms collect produce at the farmgate, while delivering all the inputs to the farmer. The firm has been around for over two decades. In addition, unlike gherkins or papaya, there is a vibrant alternate domestic market. In the case of marigold, therefore, the fixed price offered by the firm and the relative indifference to quality makes it a reliable insurance mechanism for the farmer. Indeed, as Chapter 10 elaborates, the spot market offers a lucrative sideselling option during festive occasions when the marigold price spikes. For the farmer, the alternative of growing for the spot market and growing on contract are not mutually exclusive owing to weak contract enforcement.

For broiler, there are no substantial perceived risks and those that exist have to do with the placement of birds, administration of vaccines, quality of feed and timely lifting of birds. In general,

Figure 7.6: Net Incremental Risk from Contracting by Commodity and Contracting Status, 2008-09

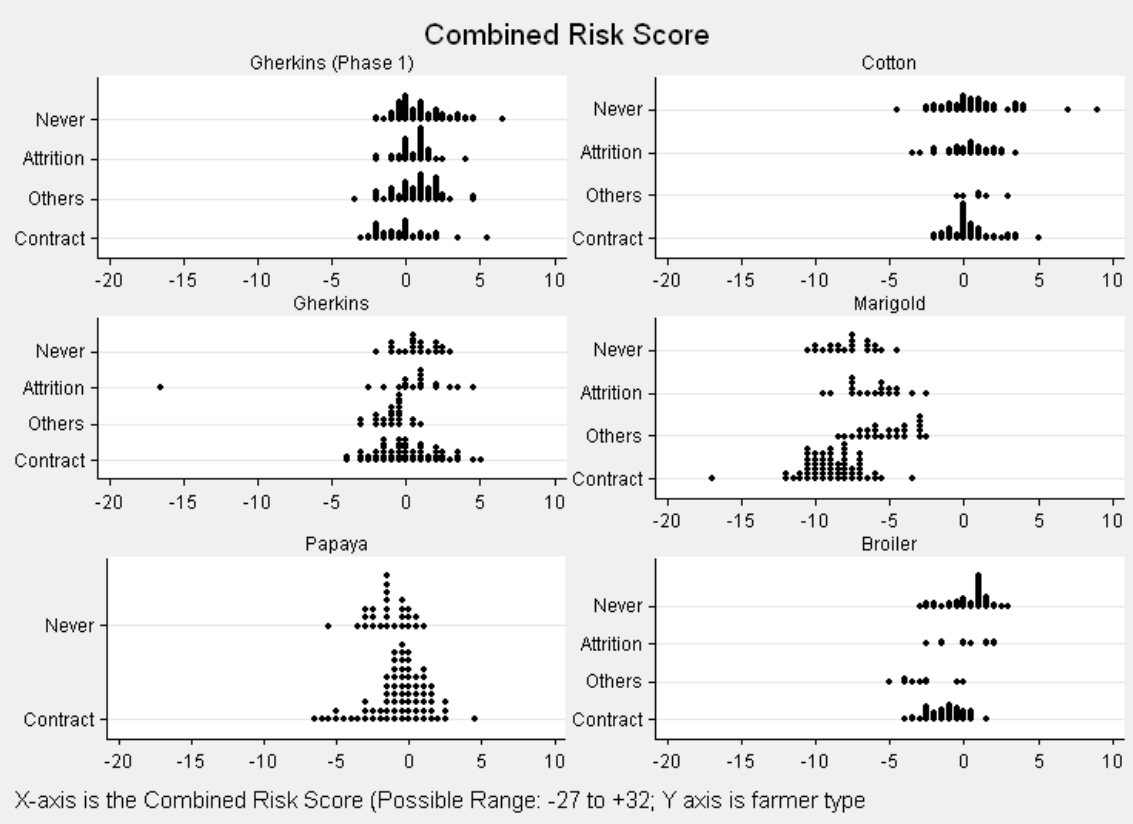


Table 7.5: To Contract or Not: Mapping Farmer Perceptions of Alternatives

Commodity and Farmer Type	Risk Scores			Number of Farmers
	Combined Risk Score	Criticality Risk Score	Frequency Risk Score	
	Range: -270 to +320			
All commodities				
Subject Contract Farmers	-1.57	-1.85	-1.92	347
Other Contract Farmers	-1.24	-1.30	-1.48	122
Attrition Farmers	-0.65	-0.91	-0.84	118
Never Contract Farmers	-0.61	-0.81	-0.83	241
Gherkins				
Subject Contract Farmers	-2.93	-0.42	-15.40	95
Other Contract Farmers	-24.30	-3.64	-19.41	82
Attrition Farmers	58.91	35.19	61.29	58
Never Contract Farmers	65.85	92.15	55.51	81
Cotton				
Subject Contract Farmers	0.28	0.55	0.40	60
Other Contract Farmers	0.53	1.20	0.68	6
Attrition Farmers	0.32	0.36	0.36	32
Never Contract Farmers	0.55	0.94	0.56	52
Marigold				
Subject Contract Farmers	-6.12	-8.71	-7.28	59
Other Contract Farmers	-3.27	-4.88	-3.84	24
Attrition Farmers	-3.82	-5.82	-4.61	18
Never Contract Farmers	-4.61	-7.12	-5.50	21
Broiler				
Subject Contract Farmers	-1.94	-1.07	-2.41	61
Other Contract Farmers	-3.00	-2.73	-3.87	10
Attrition Farmers	-0.95	0.20	-1.17	10
Never Contract Farmers	-0.29	0.30	-0.30	60
Papaya				
Subject Contract Farmers	-0.96	-0.51	-1.21	72
Never Contract Farmers	-1.07	-1.28	-1.27	27

[1] Farmer Survey, Phase 1 and 2,2007-10.
[2] The scores are designed to lie between -270 and +320. The former is for farmers who associate contracting with only positive attributes and not contracting with only negative attributes and list all attributes as relevant, and assign the maximum score of 10 to each of these. The latter is for farmers who associate contracting with only negative attributes and not contracting with only positive attributes, treat all of these attributes as relevant and assign 10 for frequency or criticality or both.
[3] The combined risk score has been divided by 10 so that all the scores have the same range.

the broiler contracting firms exert substantial control over wholesale market prices of live birds by regulating the volume traded. Each growing cycle spans six weeks and firms calibrate the volume of chicks placed with contract farmers based on projections of market prices six weeks ahead. This implies that whenever the firm wants to curtail supply in the upcoming months, it cuts back on placements of chicks with contract farmers. Alternatively, farmers who are promised five or six poultry batches (or cycles) annually are offered fewer batches.[34] By the same token, firms can also time the picking up of the birds, so as to control supply in the wholesale market. For the broiler grower, this affects the price they get via the weight of the bird at the time of pickup, so that they might end up with a sub-optimal feed conversion ratio.

In general, several risks appear important that have important implications for why contract farming schemes are so fragile in India. Noteworthy is the farmer perception of the risk of losing land. Poor land titling often implies that farmers hesitate to sign contracts for fear that it might involve confiscation of their land in case of defaults. Close to 15 % of the sample farmers stated that they associated contracting with a firm with the possibility of losing their land. The qualitative information from the survey suggests that some of these farmers stated a preference for oral contracts on account of this.[35] Attributes that were most often cited as risk attenuating in the context of contracting were availability of inputs, technical advice and the benefits of not having to physically travel to a market to sell produce. An assured buyer who pays lumspum is also viewed as a distinct advantage, with almost 30% valuing this as a relevant benefit with contracting. Labor demands also appear to occupy a big place, as the case of gherkin illustrates.

Throughout the survey villages, it was common to find that farmers who contracted were less sure about the company they were contracting for than the field officer who interacted with them. This is not surprising, since to most of the farmers the field officer was the face of the company and took responsibility for every interaction throughout the cropping cycle. This also meant that where farmers were aware of the identity of the contracting firm, the field officer's competence was

[34]Some farmers are rationed out on the extensive margin by not being offered fewer batches per year, so that their bird sheds are left empty. Many farmers are offered fewer birds per cycle, or are rationed out on the intensive margin.

[35]Chapter 11 discusses the nature of contract and enforcement in greater detail. This is mentioned here to highlight some important aspects that affect a farmer's willingness to contract.

projected on to that of the company. The latter did not seem to have an existence independent of its personnel. The trustworthiness of the field officer also finds place in the risk map.

It is evident from the discussion that the motivation to contract is driven by considerations that interact in complex ways. Importantly, it emphasizes that it is not adequate to think of contract participation as being driven exclusively by firm preferences and to accord a substantive role to farmer willingness to participate in these arrangements.

7.4 Concluding Remarks

This chapter set out to examine the idea of contract farming as an insurance mechanism for farmers, hypothesizing that such arrangements are rather analogous to new technologies with ambivalent welfare implications. Using elicitation techniques to map farmer perceptions of returns from contract and its next best alternative this chapter suggests that contract farming is indeed a gamble. Data from the survey suggests that while contract farming is associated with a high mean return, it is also associated with a high variance of returns.

Farmers who do perceive contract farming returns as being higher than their alternatives, on an average, nevertheless might not participate if they perceive large and catastrophic risks associated with it. Further, whenever the alternative market offers options for an occasional windfall, this might override considerations of mean returns when opting out of contracts.

Implicitly, the empirical evidence presented here argues for a more careful consideration of farmer perceptions of the risks and benefits associated with contract farming when studying participation in contract farming arrangements. In particular, the psychometric mapping of risks points to the presence of a number of attributes that are not easily monetized and are hence difficult to account for through perceptions of profitability expressed in monetary terms.

These considerations of perceived risks and benefits collectively define a farmer's individual rationality constraint when a firm presents the farmer with an option to contract. The next chapter uses the metrics presented in this chapter to investigate the selection of farmers into contract farming schemes from the perspective of the firm.

Table 7.6: A Mapping of Attributes Influencing Risk Exposure under Contract and its Alternative

	Contracting						Not contracting					
	Risk enhancing			Risk reducing			Risk enhancing			Risk reducing		
	Count	C	F	Count	C	F	Count	C	F	Count	C	F
Production related attributes												
Yield fluctuations	317	7.7	4.9	31	8.0	6.9				70	9.3	7.2
Yield fluctuations on account of weather	18	8.8	6.0									
Yield fluctuation on account of pest and disease	103	9.2	6.5				32	8.8	6.9			
Initial investment										3	8.3	10.0
Cash advance for input purchase	50	7.6	5.0	57	6.6	9.0						
Credit availability	77	7.3	5.1	52	6.4	4.9	223	7.1	2.8			
Availability of inputs (Seed, fertilizers, pesticides)	50	6.9	4.9	320	8.0	7.9	87	6.8	4.8			
Quality of inputs	174	8.0	4.5				131	7.7	5.1			
Availability of labor				62	8.1	7.0	215	8.7	6.7			
Labor intensity				23	8.4	8.5				29	7.7	8.9
Input costs				3	10.0	10.0						
Labor costs							88	7.2	5.3			
Availability of technical advice				190	6.7	6.7	246	8.1	4.3	134	9.0	8.9
Qaulity of technical advice							302	8.9	6.1			
Crop duration				4	7.5	10.0						
Food self-sufficiency										30	8.9	9.8
Marketing Attributes												
Transactions time and cost							14	8.3	8.0	1	5.0	10.0
Farmgate collection				150	8.5	7.4						
Availability of buyer				226	8.9		2	5.5	1.5			
Price fluctuations	150	8.5	7.1	340	8.8	9.2				337	9.4	5.4
Price premia												
Rejection or downgrading quality of produce	162	7.7	5.0				117	8.1	5.3	29	6.9	7.9
Lumspum payments				245	8.7	9.9						
Timely payments	72	7.8	5.1	230	8.8	8.4	60	6.4	4.7			
Firm might not return to contract in the future	7	5.4	4.4									
Group default	12	8.1	3.8	141	7.6	7.2						
Firm may not show up	86	8.6	4.5			8.4						
Field officials are not trustworthy	19	7.1	5.2									
Impacts												
Impact on health	117	8.8	8.5									
Impact on soil quality	54	8.6	7.1									
Fear of losing land	112	7.1	5.2									
Self respect				7	6.4	10.0						
Firm bears losses				10	10.0	7.0						
Administer vaccines	1	5.0	4.0									
Sure income	42	7.9	4.8							6	7.5	7.5
Assured buyer							90	7.2	4.8	201	9.4	7.5

[1] C: Average of responses on a scale of 0 to 10 indicated criticality of the risk. This serves as criticality weights for each farmer in the computation of risk scores. F:Average of responses on a scale of 0 to 10 indicated frequency of the risk. This serves as frequency weights for each farmer in the computation of risk scores.

[2] Farmer Survey, Phase 1 and 2,2007-10.

Chapter 8

Choosing Farmers: Selection and Participation

8.1 Introduction

The previous chapter focused on farmer perceptions of the risks and returns associated with contracting for a particular commodity relative to specific alternatives available to farmers. It made the case for incorporating farmer perceptions in the analysis of farmer participation in contract farming schemes. This chapter examines the perspective of a contracting firm, whose problem is to select a portfolio of willing and reliable suppliers, in a way that minimizes the costs of transactions and reduces uncertainties in contract deliveries. In essence, the firm needs to select individual farmers with whom to contract, who not only have heterogeneous observable and unobservable attributes and perceptions as agents but are also spread over a large geographic domain.

The empirical evidence on contract farming, although rich, tends to trip over the question of which farmers participate in contract farming systems and which ones are left out. Farmer participation is important for obvious reasons. If contract farming is advocated as a way for resource poor farmers in developing countries to achieve higher incomes, for instance, it needs to be inclusive in the first place. Whether it is or not is a matter of debate.

Much of the current literature on farmer participation in dynamic supply chains, both in agro-processing as well as the supermarket-driven retail sector, focuses on whether smallholders are prone to exclusion. They also attempt to articulate shared features of agrarian systems that might promote participation of small farmers or at least not put them at a particular disadvantage.[1] This aspect has come to be called 'social performance' (Warning and Key, 2002), indicating a certain notion of 'equity' in selection.

A number of studies show that small farmers do indeed participate in modern supply chains and contract farming schemes. Some suggest they they participate overwhelmingly. There are examples

[1]See Reardon et al. (2009), Reardon and Timmer (2005) and Minot (2008) for recent reviews of this issue.

of firms contracting *exclusively* with smallholders; in others, small farmers account for a majority of participants in contract farming arrangements (Glover and Kusterer, 1990; Von Braun et al., 1989; Wang et al., 2009). In several other schemes, however, larger farmers seem the likely participants (Dileep et al., 2002; Kumar, 2007; Carter and Mesbah, 1993). This is often despite the high labor intensity of contract crops, where small farmers might be able to draw on unpaid family labor. Some studies find that large scale retailers tend to source from large-scale processors or suppliers in order to reduce transaction costs, because those processors possess adequate logistics and transportation capacity and are able to meet the private standards of the retailer. Small farmers who do not have the capital to meet the requirements of retailers tend to be excluded, as illustrated in studies of potato contracting in Ecuador (Zamora, 2004) and vegetable producers in Thailand (Boselie et al., 2003). Neven et al. (2009) find that a threshold capital vector for entrance into the supermarket channel hinders small, rainfed farms in rural Kenya. Most of the growers participating as direct suppliers to that channel are a new group of medium-sized, fast-growing commercial farms managed by well-educated farmers. These are just a few examples of recent empirical evidence. In general, it is apparent that the findings are diverse and highly context-specific. The inconclusiveness of empirical results has led observers to conclude that there exists 'theoretical ambiguity' in whether smallholders can participate or not (Reardon et al., 2009).

Typically, the study of farmer participation has involved modeling the probability of a farmer's contracting or supplier status based on a set of explanatory variables, one of which is land size. In other versions, selection is addressed as subsidiary to the question of whether contract farming increases incomes or other welfare measures. In other words, selection assumes relevance mainly in the context of measuring the true welfare impacts, where the systematic selection of some types of farmers over others could contaminate the estimation of the relationship between participation and well-being. Here, Heckman's estimator corrects for selection bias, and the size of holding enters as one variable in the selection equation. In older studies, the inclusiveness of the small farmer was gauged by simple inspection of the proportion of contractees who are small farmers. While each of these approaches provide some interesting insights, they often do not throw enough light on a

firm's process of selection and how a firm's choice of attributes interacts with farmer perceptions of contracting.

I contend that in the existing literature on farmer participation in contract farming schemes (and modern supply chains, in general), there has been an overemphasis on using farm size as a theoretical category for analysis in a way that does not throw light on critical, policy relevant aspects of contract farming practice, especially those pertaining to exclusion. In a typical empirical paper in this field today, the idea of selection and participation is rarely conceptualized with sufficient care. It does not spell out, for instance, whether the structure of the underlying economic model is one where farmers choose to contract or a firm choosing farmers or whether it is both, and how this drives the empirical approach that is used. It often refers to a static, binary notion of participation in contract farming schemes that denies farmers agency and treats a firm's selection of farmers as an event rather than as a complex process.

The study of farmer participation in terms of small versus big farmers implicitly presumes that there is something essential about the smallness or largeness of farms that drive firms to prefer one group over another. The approach of this study turns the focus of selection away from the small farmer-big farmer dichotomy based on farm size, treating it instead as a valid, but only a proximate correlate. This latter point is recognized by several scholars (Runsten and Key, 1996a,b; Dev and Rao, 2005; Glover and Ghee Lim, 1992; Miyata et al., 2009; Warning and Key, 2002; Aoki and Hayami, 2001, for example,). Sometimes the drivers of inclusion have little to do with size. Sometimes, it is social collateral (e.g., reputation for reliability). In other cases, it may be related to non-land assets, including farming equipment, irrigation, etc. Further, there might be several explanatory variables related to landholding size that are omitted from empirical models (for e.g., soil fertility) that might be misattributed to landholding size. In this context, the idea of small farmers being the parameter for judging inclusiveness may not be adequate or even appropriate, not to mention that there is no universally valid definition of a 'small farmer'. I suggest that moving away from the question of small-large categories to focus instead on the *process* of a firm's selection of farmers, offers a more nuanced understanding of the drivers of selection (which may or may not include farm size).

Towards that end, this chapter unpacks the idea of farmer selection and participation into contract farming systems, characterizing selection into contract farming schemes as a layered process, where firms first choose regions before choosing farmers with whom to contract, so that spatial selection of procurement sheds precedes the identification by contracting firms of farmers willing to contract. It attempts to model this structural process of selection, drawing on qualitative empirical material to do so. It then examines the implication of this empirical framework to assess the nature of participation of farmers in five contract farming schemes in southern India. Specifically, this chapter suggests that selection and exclusion occurs at multiple levels and firms routinely sort both over geographic regions as well as over heterogeneous farmers. It further suggests that ignoring this layered process of selection can lead to misleading conclusions regarding the drivers of farmer selection, of which inferences on whether land holding size matters or not is just one example.

My ultimate goal is to see if this conceptualization of selection supports the notion that exclusion of farmers from participation can take place at multiple levels, and whether it resolves the theoretical ambiguities of using farm size as the chief analytical category for analyzing farmer participation in contract farming schemes. This has important implications for policy. If exclusion happens both at the level of individuals as well as at the level of geographies, policy interventions need to operate at the appropriate level, targeting geographies when necessary and addressing constraints of individuals when these are relevant.

The rest of the chapter implements this idea. Following this introduction, Section 8.2 conceptualizes selection, drawing on examples from existing literature and qualitative evidence from India. Section 8.3 describes the data sources and methods used for empirical analysis. Sections 8.4 and 8.5 discuss the results from the model, while section 8.6 concludes the chapter.

8.2 Conceptualizing Participation and Selection

The starting point for conceptualizing farmer participation in or selection into contract farming schemes is to admit the notion of selection as a process and not as an event. Firms adopt a portfolio approach in their selection of farmers with whom to contract, one that balances the need

to minimize the transactions costs of contracting and the need to choose farmers to minimize moral hazard and hold up problems. This logic, along with constraints imposed by the technical-biological characteristics of the contract commodity leads firms to adopt a layered selection process (Figure 8.1).

Firms first select broad agro-climatic regions where it is feasible for contract commodities to grow, and within that choose particular geographic tracts before choosing individual farmers. Firms then pick a portfolio of contract farmers, with specific volumes (or acreage) to contract and reassess and modify this portfolio over time, based on experience and learning as well as on changes in the external conditions. All of this is conditional on farmers being willing to contract with the firm.

If selection is, in fact, a layered process comprising different stages, then excluded farmers constitute a complex, differentiated category, with a distinct set of covariates influencing each aspect or stage of the selection process.

Qualitative empirical evidence suggests that there is indeed such a structural process of selection.[2] Usually, a contracting firm chooses the region (blocks) to contract in (Figure 8.1). This way of choosing particular agro-climatic tracts seems typical in India. I refer to this spatial selection as the domain layer of selection. Firms then pick villages in these areas. Within these 'contract villages' (CV), the firm usually draws up a list of potential participants who are willing to contract, either through field officials or through intermediaries, or farmers self-identify and express a desire to participate. Subsequently, contingent on the potential participants fulfilling any eligibility criteria that the firm might establish, the firm 'chooses' farmers with whom to contract (Figure 8.1). At this stage, participation in contract farming schemes is a matching problem, of farmers willing to contract with the firm, and the firm choosing farmers with whom to contract. This is driven not just by the perceived benefits of doing so but also by mutual perceptions of reliability and trust or, inversely, riskiness. I refer to this as the matching layer.

Interviews with agribusinesses in India suggest unambiguously that this approach is universal. Agro-climatic conditions and seasonality are important considerations for spatial selection. For instance, cotton requires black soils and is typically less productive in other types of soils. Papaya

[2]This observation is based on the Agribusiness Survey, 2007-09.

does not do well in windy areas, where the trees could break. Similarly, mid-elevation works best for marigold. As a marigold processor explained, "although earlier we procured from the plains, today we focus 90% of the procurement from the mid-elevation areas. The oleoresin content is much higher in these areas. Yield of marigold is also higher. In the plains if we get 6-7 tons/acre, in the hills it could even be as high as 15 tons/acre."[3] One agribusiness executive said that the firm avoided procuring from some regions close to the plant because the gherkins that grew in that particular tract had "no color".[4] Firms often choose areas where they can procure across many seasons, in order to run the plant through the year or choose a portfolio of geographic regions where they can procure in different seasons (procurement smoothing). Sometimes firms choose regions only as a source for procuring off-season. For example, Jharkhand was seen to be attractive for potato contracting purely because it offered the processing plant potatoes during a season when potatoes were not available elsewhere.[5]

Often, plants are established within the agroclimatic zone where cultivation of the contract commodity is feasible. To that extent, plant location is a function of agro-climatic factors. Once the plant is established, perishability of produce often induces firms to procure within an acceptable radius around the plant. For papaya, for instance, once latex is extracted, it has to be used in the plant within three or four hours. So, the firms choose farmers located close to the plant. Gherkins firms in India usually procure from within a 50 kilometer radius from the plant. Gherkins are highly perishable and firms "want to get them to the processing plant as quickly as possible, within hours if possible". Other firms choose a portfolio of villages before the matching stage. These can be either to ensure yields and, hence, volumes or to obtain better contractual performance in terms of reliable deliveries. As one executive said, "we choose villages. That's what makes sense to us. We select villages where land is suitable, where there are sandy soils and good water."[6] This would reduce risks of not getting enough volumes for processing. Another said "we want to go and select villages where the farmers are very poor or tribals."[7] Yet another executive explained, "we focused

[3] Agribusiness Survey, Karamadai, Tamil Nadu,2007.
[4] Agribusiness Survey, Sirumalai, Tamil Nadu, 2007.
[5] Agribusiness Survey, Ranchi, Jharkhand, 2008.
[6] Agribusiness Survey, Bangalore, Karnataka, 2008.
[7] Agribusiness Survey, Hyderabad, Andhra Pradesh, 2008.

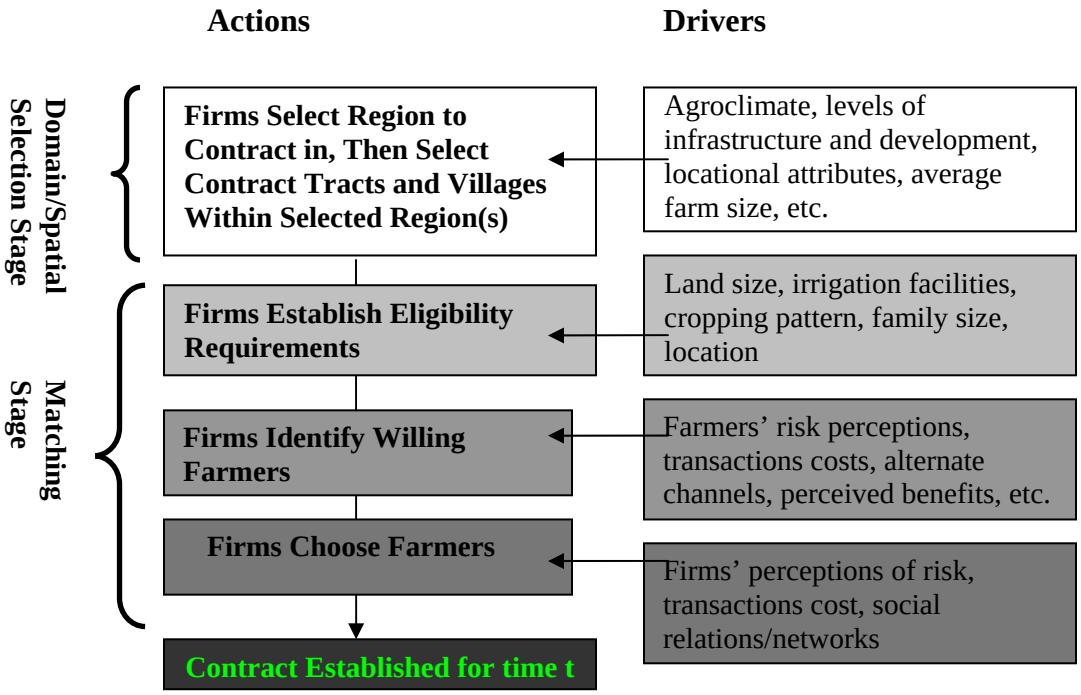
on villages that had no market access. There are many villages where farmers have no clue about the outside world, let alone about markets. Their mentality is such that they never cross the line" or transgress.[8]

Once villages are chosen, firms try to identify farmers with whom to contract. While firms try to sort heterogeneous farmer types based on location, reliability, size, soil quality and so forth, farmers perceptions of the benefits and risks associated with contract farming and its spillovers drive farmers' propensity or willingness to be considered for contracting (Chapter 7). This could include a range of factors such as entry costs, family size, perceived mean and variance of the returns to the contract crop relative to alternative uses of land and labor, social learning and beliefs about impact on soil fertility and quality, health and so on. At this stage, it is not simply a matter of firms picking farmers. There is often a time lag between a farmer getting to know of the option and actually declaring willingness to contract. In some places it is easy. An agribusiness executive said of the Punjab: "Adoption by farmers in Punjab is fairly quick. Farmers tend to watch others' fields keenly. As soon as they find something interesting, they approach you and ask : "What is this? How does it grow? What do I have to do? Can I join?".[9]

In other places, it may not be so easy. An executive explained, "In the beginning, the ethanol factory was still waiting for a license. But in order to establish link with the farmer, we undertook some demonstrations. This gave the farmers some confidence that such an option was indeed possible and real. Farmers were skeptical and did not understand the process of ethanol making."[10] In some cases, it is hard to persuade certain classes of farmers . For example, a firm contracting sorghum claims that they could never get the large and rich farmers interested in contracting because sorghum was considered a poor man's crop. Sometimes firms choose poor farmers, just like they choose distant villages, to ensure sustainable relationships. "We ensured that we picked some really vulnerable people who had few other alternatives. When there were enough people like that there was a critical mass that wanted to keep the contracting scheme going".[11] At the matching

[8] Agribusiness Survey, Dindigul, Tamil Nadu, 2007.
[9] Agribusiness Survey, New Delhi, 2008.
[10] Agribusiness Survey, Hyderabad, Andhra Pradesh, 2007.
[11] Agribusiness Survey, Vijayawada, Andhra Pradesh, 2007.

Figure 8.1: The Process of Selection and Hypothesized Stage-Specific Covariates (at time t)



stage, there is a two-sided selection process that eventually sorts farmers into contract farmers and non-participating farmers.

Thus, this conceptual framework sees farmer participation in contract farming schemes as a matching problem that is embedded in a stratified selection process. The main thrust of this chapter is to evaluate the suggestion that each stage of 'selection' (or alternately 'exclusion') can be associated with a distinct group of factors that influences the selection outcome for the farmer (Figure 8.1).

Farmer exclusion can thus happen due to multiple reasons working at different levels. For example, across the domain, farmers located in villages farther away from the processing plant or wholesale warehouse might be prone to exclusion, whereas within a 'contract' village, the farmer whose ethnicity is distinct from the 'lead' farmer or the dominant group might be excluded. Exclusion in these two settings means very different things. Farmers with comparable characteristics in different villages or geographic units could end up with different contracting status, not because

the firm chose one farmer over the other, but because the firm chose one geographic domain over the other. At this level, there is sorting of geographic units, but not of farmers. In other words, very different kinds of farmers might be equally be predisposed to participate or be selected into contract farming system purely by virtue of their shared geographic domain. Modeling this stage gets at the notion of regional specialization in particular commodities based on comparative advantage and of geographic poverty traps (Barrett and Swallow, 2006). Exclusion in the sense of which farmer is preferred, say, based on individual farmer characteristics, acquires relevance only within a selected village or hamlet. The firm sorts heterogeneous cultivators in the village, all of who are potential contractees, into contract suppliers and those who are not. It is at this stage that matching is relevant and farmers have some agency. Even where firms have the last word on whether to award a farmer a contract or not, this is predicated on there being a pool of farmers willing to take up contract farming. In empirical work, farmers are usually not accorded such agency.

Thus, if farmer exclusion from systems is relevant, the nature and cause of exclusion is critical in determining the transformative reach of contract farming, especially for poverty alleviation purposes. If, on the other hand, contract farming systematically establishes itself only in certain milieus, this would have important implications for public policy in the excluded zones.

Furthermore, when empirical work neglects this layered nature of the selection process, it can appear that there is farm size-based sorting, when, in reality, there is none. For example, if the firm needs farmers with rich soils available in specific regions, such areas tend to be more densely populated and hence have a disproportionate participation by farmers with small land size. Participation in this instance is not because of land size but on account of a common driver, soil quality, that affects both land size and contracting status.

The empirical analysis in this chapter is confined to a static notion of selection, referring to the contracting status of a farmer at a particular time. Further, it also focuses on extensive participation rather than the intensity of participation. Extensive participation is a binary concept that has to do with whether or not, at a given point of time, a farmer participates in a scheme, whereas intensity of participation refers to volumes or acreage that forms part of the contractual commitment. Extensive participation has dominated discussions of farmer participation in schemes,

and is hence the focus of this chapter.[12] Interviews with agribusinesses suggest that firms do select on the extensive margin, deeming some farmers to be more desirable partners than others. As the theoretical model in Chapter 4 suggests, the firm assesses the relative costs of transacting with a particular farmer and the reliability of the farmer to honor the contractual terms before choosing farmers. If there were perfect and costless enforcement, and if firms generally knew the differential abilities of various farmers, selection on the extensive margin would be straightforward. In a context of friction, with uncertainty and imperfect and asymmetric information on abilities, firms rely on proximate correlates to identify a pool of contract farmers from among many.

8.3 Modeling Static Selection and the Decomposition of the Sources of Participation

To address, empirically, the layered process of selection and the multiple levels of exclusion, this study adopts a simple decomposition exercise, following Heckman and Smith (2003), to judge the relative contribution of the different stages to a farmer's contracting status, as described in Figure 8.1. Such a decomposition enables determination of the sources of unequal participation and identify the level at which exclusion takes place. In addition, it is possible to identify how an attribute can be associated with contracting status differently in different stages. For instance, a firm might opt to work in geographic areas where landholding sizes tend to be large on an average, however, within that region, they might prefer to choose farmers with smaller landholdings. A decomposition exercise enables recognition of such patterns.

Let C_{itk} denote the event that a farmer i is a contract farmer at time t for commodity k. Let V_{tk} denote the event that a village is selected by the firm as a source of procurement and B_{tk} a region that the firm identifies for a procurement shed. Given the structure of selection, using probability theory, we can decompose the probability of a farmer contracting into constitutent (conditional) probabilities. Accordingly, overall, the probability that an individual farmer i contracts for a particular commodity k at time t is given is the product of different constitutent probabilities, which can be modeled as functions of stage-specific covariates ($\mathbf{X} = \mathbf{x^c}, \mathbf{x^v}, \mathbf{x^b}$).

[12] Intensive participation, or the quantity or proportion contracted, is an important dimension as well, and is addressed briefly in Chapter 10.

Define

$$\Pr\big(C_{ikt} \mid \mathbf{x^c}, \mathbf{x^v}, \mathbf{x^b}\big) = \underbrace{\Pr\big(C_{ikt} \mid V; \mathbf{x^c}\big)}_{\text{Matching Stage}} \underbrace{\underbrace{\Pr\big(V_{kt} \mid B; \mathbf{x^v}\big)}_{\text{Village Selection/Placement}} \underbrace{\Pr\big(B_{kt} \mid ; \mathbf{x^b}\big)}_{\text{Region Selection}}}_{\text{Spatial or Domain selection stage}} \tag{8.1}$$

The probability that a farmer does not contract at time t is therefore

$$\Pr\big(C'_{ikt} \mid \mathbf{x^c}, \mathbf{x^v}, \mathbf{x^b}\big) = 1 - \Pr\big(C_{ikt} \mid \mathbf{x^c}, \mathbf{x^v}, \mathbf{x^b}\big)\big) \tag{8.2}$$

Each probability listed above can be modeled distinctly, depending on the level of selection that is of particular interest. Recasting these probabilities in Equation 8.1 as dependent variables, in the context of empirical work, we have

$$\rho_c^{ikt} = \rho_{c/v}^{ikt} \times \rho_{v/b}^{kt} \times \rho_b^{kt} \tag{8.3}$$

where, $\rho_{c/v}^{ikt}$ is the probability of a firm-farm match, given that the village is selected, $\rho_{v/b}^{kt}$ is the probability that the village (V) is selected given that the region or block (B) is selected, and ρ_b^{kt} is the the probability that the region or block (B) is selected for contracting. The probabilities are, as before, superscripted to denote farmer i for commodity k at time period t. Here $(\mathbf{x^c}, \mathbf{x^v}, \mathbf{x^b})$ represents the set of explanatory variables, likely to be different in the three component regressions. We can estimate the components of the right hand side. This helps disaggregate and hence assess the relative importance or probability contribution of the different layers of selection, the domain level layer versus the matching layer for each farmer.[13]

Specifically, this allows one to examine if 'similar' farmers in terms of the propensity to be selected (that is, the estimated probabilities based on observable farmer characteristics at the matching level) still end up with different contracting status because of selection at the domain

[13]Mobley et al. (2008) use a similar approach to separate the effects of geography and individual characteristics in the use of mammography across the United States.

level. This is one kind of exclusion. The other kind of exclusion would be where the propensity of region selection is the same, but farmers could nevertheless get sorted into those who are excluded and those who are included based on individual characteristics salient in the matching stage. I use this to demonstrate the levels at which sorting by firms takes place for different contract commodities studied.

The introduction of covariates for the selection of regions adds predictive power to the issue of spatial selection, or placement effect, as it is sometimes referred to in the econometric literature. This contrasts with current practice of introducing region fixed effects to account for spatial regions, which has a weak theoretical rationale (albeit a clear statistical rationale) and little explanatory power for how firms choose geographies. The matching layer allows a reduced form representation of the principal-agent problem, where the firm as principal chooses farmers with whom to contract. At the matching stage it is possible to incorporate farmers' perceptions of contracting representing an individual farmer's individual rationality and incentive compatibility constraints. This is not the only way of organizing farmers but is a consistent way of thinking about it in the sense that it is organized with the firm as the central decision maker, although an individual farmer does have agency.

In general, the two approaches, of piecewise or sequential estimation and a one-shot estimation are not equivalent, since the latter includes all farmers in the estimation of the matching stage, involving an implicit assumption that the matching stage is relevant even in the regions that have not been chosen by the firm for contracting.

The greatest mileage from this approach is that the probability of inclusion or exclusion can be decomposed so as to isolate the pathways through which the different covariates might influence participation. By estimating each of the component probabilities, we can determine the effect of each hypothesized explanatory variable on the overall probability of participation in the contract farming scheme and can determine the level at which it works significantly. A variable that has no effect on the overall probability of participation may nevertheless have strong, but offsetting, effects on the component probabilities. In short, factors that affect selection at one stage may not affect other stages.

8.3.1 Estimation and Variables used

The different component probabilities in the selection decomposition scheme presented in Equation 8.3 can be estimated piecewise (Heckman and Smith, 2003). For a given commodity, the structure of the selection problem suggests that the most appropriate model is the conditional logit model proposed by McFadden (1974), derived from a random utility framework. Thus, for every farmer $i \in C$, where C denotes the set of farmers who are selected for contracting, it is true that

$$U(i) \geq U(j)) \forall j \in C', i \neq j, \text{ where } C' \text{ is the set of all those who do not contract.}$$

Strictly speaking, C' should refer to those who are willing to contract but the firm does not select. However, those unwilling to contract can be included in C' by assuming that their reservation level is ∞. The problem has a multinomial logit flavor, given that contracting firms decide from among various alternatives in terms of geographic regions at different scales and at the level of the individual farmer. However, since each contracting firm assesses the relative attributes of each farmer, especially in terms of the transactions costs that the farmer entails, the potential for moral hazard and of individual farmer reliability, the attributes of the farmers are the relevant covariates governing the firm's choice of a portfolio of farmers, rather than a firm's attributes, which would be shared within each commodity group.

The central task is to estimate the different stages, the component probabilities in Equation 8.3 :

$$\rho_{c/v}^{ikt} = \frac{e^{\mathbf{x^c}_{ik}\beta}}{\sum_{j \in C} e^{\mathbf{x}_{jk}\beta_{\mathbf{c/v}}}} \tag{8.4}$$

$$\rho_{v/b}^{vkt} = \frac{e^{\mathbf{x^v}_{ik}\beta}}{\sum_{v \in CV} e^{\mathbf{z}_k\beta_{\mathbf{v/b}}}} \tag{8.5}$$

$$\rho_{b}^{bkt} = \frac{e^{\mathbf{x^b}_{ik}\beta}}{\sum_{b} e^{\mathbf{z}'_k\beta_{\mathbf{b}}}} \tag{8.6}$$

In this setting, there is little justification for assuming that errors are independent across

observations. The data generating process implies correlated errors across observations within a given particular contracting scheme. First, given that for each contract commodity a single firm acts as a principal selecting a portfolio of farmers in order to maximize expected profits, net of production and transactions costs, the first order condition derived in Chapter 4 implies that the firm chooses farmers and quantities for contracting so as to equalize the risk-transactions costs ratio across the farmers. Given the structural process of selection, there is potentially a clustering effect that drives selection. This leads to a breakdown of the assumption of the Independence of Irrelevant Alternatives (IIA), while inducing spatially correlated errors across observations. In order to get efficient estimators of the coefficients on the stage-specific covariates, I first estimate stage specific equations as conditional likelihood regressions. Estimating this model gives consistent but inefficient estimates of the coefficients, due to the correlated error structure. Owing to the absence of data on spatial coordinates, I cluster standard errors at the hamlet or village level, that corrects for correlation within the village or hamlets.[14] In addition, I correct errors for heteroscedaticity.

8.3.2 Data and Variables

Recalling the figure from the Appendix A on the sampling structure (Figure 8.2), I build up a dataset that integrates secondary data on region characteristics with primary data from the Farmer Survey that contains characteristics of contract and non-contract farmers. Starting with complete lists of contract farmers in the study area, provided by the five contracting firms, I identified contract hamlets (CH) and non-contract hamlets(NCH) for each commodity and based on the location of the hamlets, identified all the panchayat villages in the sample districts, dividing them into contracting villages (CV) or non-contracting villages (NCV). A similar exercise was carried out sequentially for the larger administrative units, blocks and districts. This offers a mapping of the sample firms' choice of regions for contracting. These data were matched with available secondary data on regional characteristics. The decadal census in India collects data on village level facilities, comprising 141 variables representing village amenities, i.e., locational attributes, infrastructure, communication,

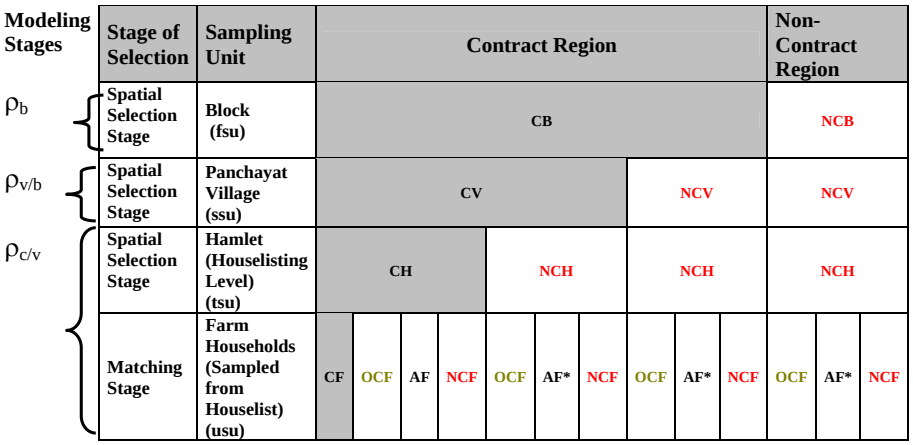
[14] A number of recent studies explore the issue of spatially correlated errors in the context of conditional logit models Conley (1999); Duchesne et al. (2010); Anselin (1988); Heckman and Smith (2003). Conley (1999) develops a GMM correction for the covariance matrix for logit models with spatially correlated errors, implementable in STATA.

irrigation, finance and social development infrastructure. I combined these with the population census that gives the the socio-demographic and occupational profile of the population in these villages. For the districts in the study area, there are data for 2714 villages.

The Farmer Survey, representing different types of farmers distinguished on the basis of contracting status, sampled respondents at the level of the hamlet (or habitations). Typically, several such hamlets constitute a panchayat village, for which census data on village facilities is available. Contracting and non-contracting hamlets were therefore mapped to their corresponding census village so that it is possible to assign to the hamlets data for village level facilities. [15]

In estimating the different stages, I use block and village selection as sequential stages in the domain layer or spatial selection. I estimate the model pertaining to the matching layer at the village level and cluster the standard errors at the hamlet or village levels, depending on the commodity.

Figure 8.2: Sampling structure



Given that there are five contract commodities, I estimate the regression for each particular layer or stage, for each contract commodity separately. Based on the proposed layered structure of selection, I choose a range of stage-specific covariates.

At the block level, the probability of a block being a contract block (CB), ρ_b^{kt}, is estimated as a function of block characteristics constructed as the average of those characteristics across

[15]The data pertain to 1999 in some cases and 2001 in others. Despite the fact that it is somewhat dated, the assumption is that it faithfully captures differences in village level facilities for the purpose of the study.

villages belonging to the block. This is estimated for all the blocks in the seven study districts. As explanatory variables, I use proportion of land irrigated, proportion of land cultivated, average literacy, proportion of population belong to the Scheduled Castes or Tribes, the number or proportion of cultivators in the total workforce, population density, average farm size, average family size, and average household monthly income.

For the next level of spatial selection, estimating $\rho^{kt}_{v/b}$ I restrict the data to all villages belonging to contract block (CB). The dependent variable here is a binary variable on whether a village is a contract or non-contract village (CV or NCV, respectively). This is regressed on a set of variables denoting facilities and socio-demography at the village level, from the decadal census. These include the same set of variables used for the model for block selection.

Tables 8.1 and 8.2 presents comparisons of the means these independent variables for farmers who contract with the subject firm of the contract commodity and all other farmers in the sample, irrespective of the scheme for which they were sampled. Thus, in the regression models for selection, a subject contract farmer is one who contracts with the subject firm for a particular commodity and the comparison group (referred to in the tables as "All farmers other than Subject Contract Farmers' refers to farmers who do not contract for that particular commodity with the subject firm. This category thus includes farmers who might grow the contract commodity for other firms that are not the subject firm and also those who may be contracting for some other commodity altogether.

For the matching layer of selection, the estimation of $\rho^{kt}_{c/v}$ I now use data from the Farmer Survey restricting the data to the selected sample villages (CV), where within CVs the Farmer Survey comprises data on contract and non-contract farmers. At this level of selection, to reflect matching, I use farmer characteristics, which firms might use as proxies for reliability or transactions cost, as well as farmer perceptions of the benefits and risks of contracting with the sample firm, that reflect farmers' individual rationality constraint. These variables were developed in Chapter 7.

Tables 8.3 through 8.8 record the summary statistics of variables that are used in the matching stage regressions for contract participation.

Table 8.1: Summary Statistics of Correlates of Spatial Selection

	Marigold			Broiler			Papaya		
	Farmers excl. Subject Contract Farmers	**Subject Contract Farmers**	t-statistic	**Farmers excl. Subject Contract Farmers**	**Subject Contract Farmers**	t-statistic	**Farmers excl. Subject Contract Farmers**	**Subject Contract Farmers**	t-statistic
Block level attributes									
Total number of cultivators	9352	10425	-0.28	9248	10464	-0.73	9191	10969	-1.06
Total number of households	18551	17339	0.24	17894	24116	-2.87 ***	18218	21265	-1.36 *
Agricultural labor (% of total workforce)	32	31	0.06	31	34	-0.59	31	38	-2.01**
Main cultivators (% of total workforce)	13	15	-0.43	13	12	0.81	13	13	0.11
Proportion of land under cultivation (% of all land)	0.59	0.54	0.36	0.57	0.74	-2.45 ***	0.6	0.55	0.66
Proportion of land not available for cultivation (% of all land)	0.15	0.3	-2.16 **	0.16	0.1	1.96 **	0.15	0.2	-1.72 **
Proportion of cultivated land that is irrigated (%)	41	31	0.6	41	36	0.72	40	49	-1.27
Total area of cultivated land	13281	13656		12128	23518	1.23	13157	14447	
Population density (persons per acre)	3.58	2.65	0.68	3.64	2.89	1.79 **	3.58	3.48	0.16
Average household size	3.89	3.96	-0.32	3.91	3.75	-0.96	3.88	4	-1.34 *
Literacy Rate (% of total population)	56	44	3.09 ***	55	57	-0.76	56	55	0.28
Scheduled Caste /Tribe population (% of total population)	21	20	0.14	20	22	-2.28 ***	21	20	0.15
Total population	72365	67965	0.22	70237	90324	1.16	70840	85011	-1.59 *
Average distance of villages from their nearest town (kms)	11	23	-2.42 ***	12	9	-2.53 ***	11	14	-1.18
Average income per household per year (Rs.)	405998	793794	-1.16	375604	744529	-3.21 ***	408901	450911	-0.28
Village level attributes									
Total number of cultivators	403	886	-3.16 ***	404	434	-0.51	403	675	-2.52 ***
Total number of households	799	1145	-1.39 *	795	1039	-2.53***	798	1175	-2.14 **
Agricultural labor (% of total workforce)	33	25	1.19	33	32	0.22	33	38	-1.08
Main cultivators (% of total workforce)	14	20	-1.45 *	14	13	1.05	14	16	-0.54
Proportion of land under cultivation (% of all land)	1	1	1.08	1	1	-7.52 ***	1	1	1.31 *
Proportion of land not available for cultivation (% of all land)	0	0	-2.45 ***	0	0	3.51***	0	0	-0.18
Proportion of cultivated land that is irrigated (%)	47	12	3.21 ***	47	39	1.85 **	47	62	-1.98 **
Total area of cultivated land (acres)	572	1263	1.13	564	1011	1.49 *	573	783	0.38
Population density (persons/acre)	5	2	-1.28	5	3	3.1 ***	5	4	-0.21
Average household size	4	4	4.57 ***	4	4	-1.71 **	4	4	-0.07
Literacy Rate (% of total population)	54	38	0.99	54	57	-1.4 *	54	55	-0.26
Scheduled Caste /Tribe population (% of total population)	21	15	-1.6 *	21	24	-2.08**	21	22	-2.22 **
Total population	3118	4691	-6.39 ***	3105	3900	2.99 ***	3113	4661	0.68
Average distance of villages from their nearest town (kms.)	11	32	-0.42	11	8	-0.61	11	10	-0.17
Average income per household per year (Rs.)	398645	685192	-0.88	396033	559368	-1.56 *	399033	481621	0.63

Significance levels : ∗ : 10% ∗∗ : 5% ∗ ∗ ∗ : 1%

[1] The original source of data is Census 2001, Village Amenities, Government of India

[2] Subject Contract farmers contract with the subject firm, Farmers excluding Subject Contract farmers include all other farmers in the sample for the particular Phase.

Table 8.2: Summary Statistics of Correlates of Spatial Selection

	Gherkin Phase 2			Gherkin Phase 1			Cotton 07-08		
	Farmers excl. Subject Contract Farmers	**Subject Contract Farmers**	t-statistic	**Farmers excl. Subject Contract Farmers**	**Subject Contract Farmers**	t-statistic	**Farmers excl. Subject Contract Farmers**	**Subject Contract Farmers**	t-statistic
Block level attributes									
Total number of cultivators	9393	9013	0.12	9268	10667	-0.72	9290	10761	-0.66
Total number of households	18187	24333	-2.11 **	18328	21029	-1.05	18559	18001	0.19
Agricultural labor (% of total workforce)	31	34	-0.59	31	39	-1.82 **	31	35	-0.82
Main cultivators (% of total workforce)	13	9	1.7 **	13	12	0.69	13	15	-0.8
Proportion of land under cultivation (% of all land)	0.6	0.5	1.03	0.6	0.51	1.15	0.58	0.79	-2.42 ***
Proportion of land not available for cultivation (% of all land)	0.16	0.2	-1.06	0.16	0.18	-0.56	0.16	0.17	-0.34
Proportion of cultivated land that is irrigated (%)	40	54	-1.46 *	40	46	-0.68	41	30	1.2
Total area of cultivated land	13294	13191	-1.24	13281	13381	-0.05	13170	15292	-0.14
Population density (persons per acre)	3.51	4.51	-3.87 ***	3.56	3.6	-3.58 ***	3.56	3.67	0.77
Average household size	3.87	4.31	-1.21	3.87	4.22	-0.18	3.9	3.81	2.47 ***
Literacy Rate (% of total population)	55	58	1.26	56	56	0.29	56	50	1.77 **
Scheduled Caste /Tribe population (% of total population)	21	18	-3 ***	21	20	-1.79 **	21	16	0.36
Total population	70373	104746	-0.36	70922	89290	-0.13	72522	68217	1.59 *
Average distance of villages from their nearest town (kms)	11	12	-0.36	11	12	-0.67	12	7	0.94
Average income per household per year (Rs.)	409194	480947	1.6 *	404618	520205	1.19	423434	238865	-0.97
Village level attributes									
Total number of cultivators	403	615	-2.29 **	402	684	-2.98 ***	402	765	-3.76 ***
Total number of households	798	1069	-1.8 **	798	1092	-1.91 **	796	1306	-3.23 ***
Agricultural labor (% of total workforce)	33	34	-0.17	33	39	-1.38 *	33	37	-1
Main cultivators (% of total workforce)	14	13	0.79	14	14	0.11	14	16	-0.47
Proportion of land under cultivation (% of all land)	1	1	0.44	1	1	1.62 *	1	1	-4.36 ***
Proportion of land not available for cultivation (% of all land)	0	0	-2.24 **	0	0	-1.36 *	0	0	2.26**
Proportion of cultivated land that is irrigated (%)	47	32	2.25 **	47	40	1.04	47	38	1.33
Total area of cultivated land (acres)	572	816	0.45	572	843	1.1	571	930	-0.93
Population density (persons/acre)	5	4	-5.56 ***	5	3	-5.3 ***	5	6	-0.05
Average household size	4	4	0.5	4	4	0.73	4	4	3.86 ***
Literacy Rate (% of total population)	54	53	0.84	54	53	0.65	54	46	2.68 ***
Scheduled Caste /Tribe population (% of total population)	21	18	-2.83 ***	21	19	-2.76 ***	21	12	-3.26 ***
Total population	3108	4791	-2.8 ***	3108	4792	-3.36 ***	3106	5140	2.22 **
Average distance of villages from their nearest town (kms.)	11	17	0.27	11	18	-0.61	11	7	0.26
Average income per household per year (Rs.)	400560	287199	1	397373	657860	0	400459	288394	1

Significance levels : ∗ : 10% ∗∗ : 5% ∗ ∗ ∗ : 1%

[1] The original source of data is Census 2001, Village Amenities, Government of India

[2] Subject Contract farmers contract with the subject firm, Farmers excluding Subject Contract farmers include all other farmers in the sample for the particular Phase.

In this instance, I assume selection based on observables. While there may be several unobservable factors that drive firms to select some blocks over others, detailed interviews with the sample firms on what constitutes the basis for selection of geographies, suggest that the covariates identified as explanatory variables together account for the chief drivers of selection or serve as credible proxies for the unobservables.[16]

I use estimates from this set of models for two broad purposes. The first seeks validation of the idea that ignoring spatial selection in examining farmer selection could potentially lead to misleading conclusion regarding the drivers of selection. The second is to map the layer at which exclusion possibly occurs. The goal is to investigate whether firms choose geographies or farmers or both and how these differ across commodities.

8.4 The Problem of Misattribution

To validate the idea that ignoring spatial selection does matter for inference, I present results from two probit regression models for each contract commodity. The first regresses farmers' current contracting status on matching layer covariates for the sample farmers across all blocks, accounting for placement via variables representing firm presence in the block. The second works with a restricted sample of only selected villages or contract villages (CV) and regresses current contracting status on the same set of covariates as in the first model. Of the two, the former ignores the domain or spatial selection layer and is hence equivalent to a one shot estimation (equivalent to estimating ρ_c), whereas the latter, focusing on selection within contract villages (CV), presumes that regional sorting has occurred previously (equivalent to estimating $\rho_{c/v}$). These two models are equivalent only when each village is a contract village (CV). Both models control for a rich array of farmer perceptions of subjective distributions from contracting and the next best alternative that potentially account for a lot of variables that might be jointly determined with farm size.

The results show that the drivers of selection that emerge as statistically significant are different across the two models, implying that accounting for spatial selection leads to results that differ from

[16] In principle, it is feasible to incorporate indicators representing various geophysical and agroclimatic features. Owing to the difficulty in procuring this data for the required level of disaggregation, I have been unable to account for a richer set of geographic and agroclimatic characteristics.

Table 8.3: Summary Statistics for Farmer Selection: Gherkins Phase 2

	Farmers excl. Subject Contract Farmers (n=420)				Subject Contract farmers (n=54)			
	Mean or Proportion	Standard Deviation	Minimum	Maximum	Mean or Proportion	Standard Deviation	Minimum	Maximum
Explanatory variable								
Land owned (acres)	6.1	8.5	0	106	2.4	5.4	0	40
Distance from the nearest wholesale market	1.1	4.8	0	50	0.4	0.6	0	3
Distance from the nearest wholesale market (kms.)	17.1	17.3	1	150	12.4	7.9	0	40
Percentage of operated land irrigated(%)	77	30.5	0	100	74.1	28.6	17	100
(D) Farmers whose main source of irrigation is rain (%)	64	N.A.	0	1	98	N.A.	0	1
Age (years)	45.9	11	23	80	37.4	8.9	22	70
Household size	4.2	1.3	2	12	5.5	1.9	3	12
Percentage of annual income from cultivation(%)	87.4	22.6	0	100	79.1	20.9	20	100
Debt (Rs.)	0.1	0.2	0	2	0	0	0	0
Percentage of food purchased (%)	88.7	15.4	0	100	83.7	17.4	30	100
(D) Family belongs to the botton 40% of households in the village(%)	5	N.A.	0	1	57	N.A.	0	1
(D) Farmer is illiterate (%)	19	N.A.	0	1	20	N.A.	0	1
(D) The most educated member of the family has completed primary school (%)	40	N.A.	0	1	30	N.A.	0	1
(D) The most educated member of the family is illiterate (%)	0	N.A.	0	0	0	N.A.	0	0
Scheduled Caste or Tribe (%)	0.1	0.2	0	1	0	0	0	0
Risk aversion to open market prices	1.1	0.3	0	2	1.3	0.1	1	1
Combined risk score for commodity-specific control farmers	0.8	53.9	-325	338	-5.6	182	-400	350
Ratio of mean returns from contracting over next best alternative	0.4	1.8	0	27	3.4	5.2	0	25
Ratio of coefficient of variation in returns from contracting and next best alternative	0.04	0.1	0	1	0.3	0.2	0	1
Difference in Skewness in returns from contracting and next best alternative	0.02	0.2	-2	2	-0.1	0.6	-1	2
(D) Contracting first order stochastic dominates next best alternative (%)	9	N.A.	0	1	56	N.A.	0	1
(D) Contracting second order stochastic dominates next best alternative (%)	10	N.A.	0	1	59	N.A.	0	1
The number of villages in the block the firm contracts in	1.4	3.5	0	11	7.9	4	2	11
The number of hamlets sample firm procures from in the block	4	10.5	0	33	22.5	13.3	6	33
Sunk Cost (Rs.)	17677	38258	0	211580	10685	38757	0	275000

[1] (D) refers to binary variables that take the value of 0 or 1. The percentage of responses are reported for these instead of the mean. N.A. means Not Applicable.

[2] Subject Contract farmers refer to those who contract with the subject firm. All Farmers excluding Subject Contract Farmers refer to all other farmers in the sample of the particular phase who do not contract with the Subject firm. They include, among others, farmers who contract for the same or another commodity with non-subject firms.

Table 8.4: Summary Statistics for Farmer Selection:Marigold

	Farmers excl. Subject Contract Farmers (n=415)				Subject Contract farmers (n=59)			
	Mean or Proportion	Standard Deviation	Minimum	Maximum	Mean or Proportion	Standard Deviation	Minimum	Maximum
Explanatory variable								
Land owned (acres)	5.7	8.7	0	106	5.2	3.8	1	25
Distance from the nearest wholesale market	0.9	4.8	0	50	1.6	1.8	0	10
Distance from the nearest wholesale market (kms.)	14.9	15.1	1	150	28.0	21.0	1	80
Percentage of operated land irrigated(%)	74.7	30.7	0	100	90.2	23.2	0	100
(D) Farmers whose main source of irrigation is rain (%)	70	N.A.	0	1	53	N.A.	0	1
Age (years)	44.9	10.9	22	79	45.3	12.3	25	80
Household size	4.4	1.4	2	12	4.4	1.8	2	12
Percentage of annual income from cultivation(%)	85	23.5	0	100	97	8.7	50	100
Debt (Rs.)	0.1	0.2	0	2	0.2	0.3	0	2
Percentage of food purchased (%)	89.6	15.5	30	100	78.1	13.6	0	95
(D) Family belongs to the botton 40% of households in the village(%)	28	N.A.	0	1	44	N.A.	0	1
(D) Farmer is illiterate (%)	6	N.A.	0	1	44	N.A.	0	1
(D) The most educated member of the family has completed primary school (%)	38	N.A.	0	1	46	N.A.	0	1
(D) The most educated member of the family is illiterate (%)	0	N.A.	0	0	0	N.A.	0	0
(D) Scheduled Caste or Tribe (%)	1	N.A.	0	1	27	N.A.	0	1
Risk aversion to open market prices	9.1	2.2	0	13	6.4	1.3	2	13
Combined risk score for commodity-specific control farmers	-58.8	148.6	-668	0	-601.7	169.1	-1297	0
Ratio of mean returns from contracting over next best alternative	0.2	0.7	0	7	0.8	0.7	0	3
Ratio of coefficient of variation in returns from contracting and next best alternative	0	0.1	0	0	0.2	0.1	0	1
Difference in Skewness in returns from contracting and next best alternative	0.1	0.4	-3	3	0.3	1	-2	3
(D) Contracting first order stochastic dominates next best alternative (%)	3	N.A.	0	1	14	N.A.	0	1
(D) Contracting second order stochastic dominates next best alternative (%)	4	N.A.	0	1	19	N.A.	0	1
The number of villages in the block the firm contracts in	0.5	1.3	0	5	4.3	1	3	5
The number of hamlets sample firm procures from in the block	2.3	5.5	0	16	12	2.9	10	16
Sunk Cost (Rs.)	19178	40406	0	275000	719	5402	0	41500

[1] (D) refers to binary variables that take the value of 0 or 1. The percentage of responses are reported for these instead of the mean. N.A. means Not Applicable.
[2] Subject Contract farmers refer to those who contract with the subject firm. All Farmers excluding Subject Contract Farmers refer to all other farmers in the sample of the particular phase who do not contract with the Subject firm. They include, among others, farmers who contract for the same or another commodity with non-subject firms.

Table 8.5: Summary Statistics for Farmer Selection:Papaya

	Farmers excl. Subject Contract Farmers (n=402)				Subject Contract farmers (n=72)			
	Mean or Proportion	Standard Deviation	Minimum	Maximum	Mean or Proportion	Standard Deviation	Minimum	Maximum
Explanatory variable								
Land owned (acres)	5.7	8.7	0	106	5.7	5	0	25
Distance from nearest surfaced road (meters)	1.1	4.9	0	50	0.8	1.4	0	6
Distance from the nearest wholesale market (kms.)	18.0	17.3	1.0	150.0	8.2	6.4	1.0	30.0
(D) Percentage of operated land irrigated(%)	74.6	31.3	0	100	88.3	20.1	30	100
Farmers whose main source of irrigation is rain (%)	62.2	N.A.	0	1	90	N.A.	1	1
Age (years)	44.9	11.4	22	80	45.1	9.5	27	70
Household size	4.4	1.5	2	12	4.3	1	3	7
Percentage of annual income from cultivation(%)	87.8	21.2	0	100	78.8	27.9	10	100
Debt (Rs.)	0.1	0.2	0	2	0	0	0	0
(D) Percentage of food purchased (%)	86.7	16	0	100	96.3	10.9	50	100
(D) Family belongs to the botton 40% of households in the village(%)	32	N.A.	0	1	25	N.A.	0	1
(D) Farmer is illiterate (%)	22	N.A.	0	1	7	N.A.	0	1
(D) The most educated member of the family has completed primary school (%)	39	N.A.	0	1	39	N.A.	0	1
(D) The most educated member of the family is illiterate (%)	0	N.A.	0	0	0	N.A.	0	0
Scheduled Caste or Tribe (%)	0	0.2	0	1	0.1	0.2	0	1
Risk aversion to open market prices	4.6	1.2	0	7	4.1	1.3	0	6
Combined risk score for commodity-specific control farmers	-7.2	46	-490	130	-96.1	186.2	-610	455
Ratio of mean returns from contracting over next best alternative	0.2	1	0	11	1.3	1	0	4
Ratio of coefficient of variation in returns from contracting and next best alternative	0	0.1	0	1	0.2	0.1	0	0
(D) Difference in Skewness in returns from contracting and next best alternative	0	0.2	-2	2	-0.1	1.1	-3	2
(D) Contracting first order stochastic dominates next best alternative (%)	3.5	N.A.	0	1	32	N.A.	0	1
Contracting second order stochastic dominates next best alternative (%)	3.7	N.A.	0	1	36	N.A.	0	1
The number of villages in the block the firm contracts in	0.3	0.6	0	3	1.6	0.9	1	3
The number of hamlets sample firm procures from in the block	0.6	1.1	0	7	2.9	2.6	1	7
Sunk Cost (Rs.)	18702	39767	0	275000	6708	27135	0	200000

[1] (D) refers to binary variables that take the value of 0 or 1. The percentage of responses are reported for these instead of the mean. N.A. means Not Applicable.

[2] Subject Contract farmers refer to those who contract with the subject firm. All Farmers excluding Subject Contract Farmers refer to all other farmers in the sample of the particular phase who do not contract with the Subject firm. They include, among others, farmers who contract for the same or another commodity with non-subject firms.

Table 8.6: Summary Statistics for Farmer Selection:Broiler

	Farmers excl. Subject Contract Farmers (n=413)				Subject Contract farmers (n=61)			
	Mean or Proportion	Standard Deviation	Minimum	Maximum	Mean or Proportion	Standard Deviation	Minimum	Maximum
Explanatory variable								
Land owned (acres)	5.4	8.4	0	106	7.4	6.8	0	45
Distance from nearest surfaced road (meters)	1.1	4.8	0	50	0.3	0.8	0	5
Distance from the nearest wholesale market (kms.)	16.0	15.8	1.0	150.0	20.2	20.6	3.0	150.0
Percentage of operated land irrigated(%)	79.7	28.8	0	100	56.4	32.6	0	100
(D) Farmers whose main source of irrigation is rain (%)	72.4	N.A.	0	1	38	N.A.	0	1
Age (years)	44.7	11	22	80	46.4	11.7	29	75
Household size	4.5	1.5	2	12	3.6	0.8	2	5
Percentage of annual income from cultivation(%)	85.4	23.1	0	100	93.4	17	25	100
Debt (Rs.)	0.1	0.1	0	1.5	0.2	0.3	0	2
Percentage of food purchased (%)	86.7	15.8	0	100	98	10.9	30	100
(D) Family belongs to the botton 40% of households in the village(%)	35.8	N.A.	0	1	0	N.A.	0	0
(D) Farmer is illiterate (%)	21.8	N.A.	0	1	3	N.A.	0	1
(D) The most educated member of the family has completed primary school (%)	35.8	N.A.	0	1	49	N.A.	0	1
(D) The most educated member of the family is illiterate (%)	0	N.A.	0	0	0	N.A.	0	0
(D) Scheduled Caste or Tribe (%)	5.1	N.A.	0	1	2	N.A.	0	1
Risk aversion to open market prices	1.4	0.4	0	2	1.6	0.4	0	2
Combined risk score for commodity-specific control farmers	-13.4	62.9	-379	175	-193.7	78.4	-367.5	-23
Ratio of mean returns from contracting over next best alternative	0.05	0.1	0	1	0.2	0.2	0	0.5
Ratio of coefficient of variation in returns from contracting and next best alternative	0.03	0.1	0	0	0.1	0.1	0	0.3
Difference in Skewness in returns from contracting and next best alternative	-0.02	0.1	-1.302869	1	0.1	0.3	-0.5	1
The number of villages in the block the firm contracts in	1.4	3.1	0	12	6.9	3.9	0	12
The number of hamlets sample firm procures from in the block	2.1	4.9	0	20	10.5	6.1	0	20
Sunk Cost (Rs.)	7159	26927	0	275000	82700	39411	25500	211580

[1] (D) refers to binary variables that take the value of 0 or 1. The percentage of responses are reported for these instead of the mean. N.A. means Not Applicable.

[2] Subject Contract farmers refer to those who contract with the subject firm. All Farmers excluding Subject Contract Farmers refer to all other farmers in the sample of the particular phase who do not contract with the Subject firm. They include, among others, farmers who contract for the same or another commodity with non-subject firms.

Table 8.7: Summary Statistics for Farmer Selection: Gherkins Phase 1

	Farmers excl. Subject Contract Farmers (n=308)				Subject Contract farmers (n=40)			
	Mean or Proportion	Standard Deviation	Minimum	Maximum	Mean or Proportion	Standard Deviation	Minimum	Maximum
Explanatory variable								
Land owned (acres)	4.1	4.5	0	38	2.5	2.1	0	10
Distance from nearest surfaced road (meters)	1290.8	1730.2	0	18000	775	735.1	20	3000
Distance from the nearest wholesale market (kms.)	6.5	8.3	1	75	14.3	14.8	0	60
Percentage of operated land irrigated(%)	51.3	35.5	0	100	57.3	40.6	0	100
(D) Farmers whose main source of irrigation is rain (%)	95	N.A	0	1	93	N.A	0	1
Age (years)	43.2	12	1	83	40.2	11.9	18	60
Household size	5	1.7	1	12	5.4	1.6	3	11
Percentage of annual income from cultivation(%)	66.6	31.9	5	100	70.3	27.2	10	100
Debt (Rs.)	41.2	78	0	700	55.3	80.7	0	400
Percentage of food purchased (%)	59.3	25.8	0	100	51.7	30.4	0	100
(D) Family belongs to the botton 40% of households in the village(%)	30	N.A	0	1	38	N.A	0	1
(D) Farmer is illiterate (%)	14	N.A	0	1	18	N.A	0	1
(D) The most educated member of the family has completed primary school (%)	48	N.A	0	1	40	N.A	0	1
(D) The most educated member of the family is illiterate (%)	0	N.A	0	1	0	N.A	0	0
(D) Scheduled Caste or Tribe (%)	19	N.A	0	1	28	N.A	0	1
Risk aversion to open market prices	1.2	0.1	1	2	1.2	0.1	1	1
Combined risk score for commodity-specific control farmers	28.5	76.6	-150	375	-0.4	103.7	-195	289
Ratio of mean returns from contracting over next best alternative	0.9	3.1	0	50	2.1	1.4	0	6
Ratio of coefficient of variation in returns from contracting and next best alternative	0.6	1	0	9	1.5	0.9	0	5
Difference in Skewness in returns from contracting and next best alternative	0	0.6	-4	2	0	0.9	-3	2
(D) Contracting first order stochastic dominates next best alternative (%)	22	N.A	0	1	35	N.A	0	1
(D) Contracting second order stochastic dominates next best alternative (%)	24	N.A	0	1	45	N.A	0	1
The number of villages in the block the firm contracts in	2.5	3.2	0	8	5.1	2.9	1	8
The number of hamlets sample firm procures from in the block	6.8	8.9	0	22	14.1	7.9	2	22
Sunk Cost (Rs.)	373	2240	0	30000	640	1303	0	5000

[1] (D) refers to binary variables that take the value of 0 or 1. The percentage of responses are reported for these instead of the mean. N.A. means Not Applicable.

[2] Subject Contract farmers refer to those who contract with the subject firm. All Farmers excluding Subject Contract Farmers refer to all other farmers in the sample of the particular phase who do not contract with the Subject firm. They include, among others, farmers who contract for the same or another commodity with non-subject firms.

Table 8.8: Summary Statistics for Farmer Selection:Cotton

	Farmers excl. Subject Contract Farmers(n=288)				Subject Contract farmers (n=60)			
	Mean or Proportion	Standard Deviation	Minimum	Maximum	Mean or Proportion	Standard Deviation	Minimum	Maximum
Explanatory variable								
Land owned (acres)	3.8	4.6	0	38	4.5	2.4	0	12
Distance from nearest surfaced road (meters)	1103.9	1349.7	0	16000	1843.8	2602.2	55	18000
Distance from the nearest wholesale market (kms.)	8.1	10.3	1	75	4.3	3.2	0.2	12
Percentage of operated land irrigated(%)	51.7	36.7	0	100	53.6	33.2	0	100
(D) Farmers whose main source of irrigation is rain (%)	94.4	N.A	0	1	95	N.A	0	1
Age (years)	42.7	12.5	1	83	43.9	9.1	25	70
Household size	5.2	1.8	1	12	4.2	1.2	2	8
Percentage of annual income from cultivation(%)	68	30.3	5	100	62	35.7	10	100
Debt (Rs.)	44	80.8	0	700	37	65.4	0	300
Percentage of food purchased (%)	57.1	26.7	0	100	64.9	24.3	0	100
(D) Family belongs to the botton 40% of households in the village(%)	34.7	N.A	0	1	11.7	N.A	0	1
(D) Farmer is illiterate (%)	16	N.A	0	1	8.3	N.A	0	1
(D) The most educated member of the family has completed primary school (%)	45.1	N.A	0	1	56.7	N.A	0	1
(D) The most educated member of the family is illiterate (%)	0.3	N.A	0	1	0	N.A	0	0
(D) Scheduled Caste or Tribe (%)	21.9	N.A	0	1	10	N.A	0	1
Risk aversion to open market prices	2.5	0.6	1	4	3.2	0.4	1	4
Combined risk score for commodity-specific control farmers	14.5	60.7	-150	309	28.2	84.7	-130	400
Ratio of mean returns from contracting over next best alternative	0.3	1	0	13	1.4	1.6	0	8
Ratio of coefficient of variation in returns from contracting and next best alternative	0.1	0.2	0	2	0.2	0.2	0	1
Difference in Skewness in returns from contracting and next best alternative	-0.1	0.6	-5	2	-0.1	1	-3	3
(D) Contracting first order stochastic dominates next best alternative (%)	9	N.A			28.3	N.A		
(D) Contracting second order stochastic dominates next best alternative (%)	10.1	N.A			30	N.A		
The number of villages in the block the firm contracts in	1	1.6	0	4	3.3	1	2	4
The number of hamlets sample firm procures from in the block	2.4	4.1	0	11	8.3	3.8	3	11
Sunk Cost (Rs.)	425	2329	0	30000	303	935	0	5000

[1] (D) refers to binary variables that take the value of 0 or 1. The percentage of responses are reported for these instead of the mean. N.A. means Not Applicable.

[2] Subject Contract farmers refer to those who contract with the subject firm. All Farmers excluding Subject Contract Farmers refer to all other farmers in the sample of the particular phase who do not contract with the Subject firm. They include, among others, farmers who contract for the same or another commodity with non-subject firms.

an approach that does not account for levels of sorting. In the discussion here, I focus on land size (Table 8.9).

First, in case of papaya and gherkins (phase 2), land size is not significantly associated with contract participation in either model. In marigold, larger farmers are associated with greater likelihood of participation in both models. The key findings, from the perspective of this work are for broiler, gherkins (phase 1) and cotton. A one-shot model that ignores spatial selection would lead one to conclude that larger farmers are more likely to participate in broiler contracting. Yet, the model for farmer level selection within contract villages suggests farmers are not sorted by the firm on the basis of land size. Rather, the firm is selecting villages with larger mean farm size. In the case of cotton, the one shot model suggests that farm size might not matter. Yet, within the contract villages (CVs) small farmers are have a greater likelihood of contracting. In the case of gherkins (phase 1), while ignoring regional selection would lead one to conclude that land size does not matter, there is a significant positive correlation between contract participation and land size for the sample restricted to contract villages.

Table 8.9: Land Size as Driver of Selection

	ρ_c		$\rho_{c/v}$	
Explanatory Variable	Z-statistic	AME	Z-statistic	AME
Marigold	2.26	0.002 **	2.5	0.0239 **
Broiler	1.72	0.001 *	0.13	0.000
Gherkins 2	0.01	0.001	-0.75	-0.004
Gherkins 1	-0.69	-0.004	2.04	0.008 **
Cotton	-1.00	-0.004	-2.28	-0.023 **
Papaya	0.07	0.000	0.55	0.002

Significance levels : $*$: 10% $**$: 5% $***$: 1%

[1] This is excerpted from Tables 8.10,8.11 and 8.12 presented at the end of the chapter.
[2] AME is Average Marginal Effect

Tables 8.10, 8.11 and 8.12 contain the detailed estimated models showing the effect of accounting for regional selection. It suffices to say that these suggest overturning of the statistical significance for a number of variables across the two models for the different crops. These include, apart from land size, variables representing distance to the nearest surfaced road, level of outstanding debt, percentage of household income derived from cultivation, the relative poverty of households and household size. These variables are all typically used to judge inclusiveness of contract farming

schemes. The fragility of these estimates when spatial selection is or is not ignored underscores the need for careful empirical investigation and inference.

The rest of the work discusses the layers of selection, using the latter of the two models presented above as representing the estimation of the matching layer. The emphasis here is on a comparative perspective across contract farming schemes, rather than a detailed treatment on particular drivers for each scheme.

8.5 The Drivers of Selection

8.5.1 The Spatiality of Selection and Geographic Comparative Advantage

The spatial aspect of contract procurement or sourcing based on geographic characteristics is obvious enough to empirical researchers. Yet, typically survey based research focusing on a single scheme, even with multiple crops, does not allow for a comparative perspective on differences in geographies of contract procurement across heterogeneous commodities. This survey enables investigation of this idea of geographic comparative advantage since it covers multiple firms, each contracting for a different commodity.

The broiler contracting firm chooses areas (blocks) where the average cultivated land per household is high and where villages are tightly clustered around urban centers (Table 8.13). Within these blocks, however, the firm appears to pick large, more sparsely populated villages, where cultivation is not on a large scale, indicated both by the per household availability of cultivable land and by the total number of cultivators. These villages tend to depend on agriculture, given that the majority of the workforce are cultivators. The average income of the villages selected is also lower relative to those that are not.

Interviews with the marigold contracting firm suggest that marigold is sourced primarily from mid-elevation regions in the northern part of the study area, where cooler temperatures are conducive to higher yields. While the set of explanatory variables does not explicitly account for these specific attribute, they include characteristics that one would associate with the hilly regions in peninsular India (Table 8.14). The selection of blocks reflects this spatial preference accurately,

Table 8.10: The Effect of Accounting for Regional Selection: Marigold and Broiler

	Marigold				Broiler			
	ρ_c		$\rho_{c/v}$		ρ_c		$\rho_{c/v}$	
Explanatory Variable	Z-statistic	AME	Z-statistic	AME	Z-statistic	AME	Z-statistic	AME
Land owned (acres)	2.3	0.002 **	2.5	0.024 **	1.7	0.001 *	0.1	0
Distance from nearest surfaced road (kms)	-1.6	-0.001	-1.2	-0.005	0.5	0	1.4	0.053
Distance from the nearest wholesale market (kms)	1.2	0	0.4	0	0.7	0	1.2	0
Percentage of operated land irrigated	1.3	0	2	0.001 *	-1.2	-0.001	-1.1	-0.001
(D) Rainfed farm	-0.1	-0.002	3.7	0.206 ***	-0.3	-0.006	-0.5	-0.029
Age (years)	0.4	0	0.2	0	0.6	0	-0.3	-0.001
Household size	2.7	0.014 ***	3.2	0.059 ***	-2.5	-0.025 **	-0.6	-0.02
Percentage of annual income from cultivation	-1.2	-0.001	-3	-0.009 ***	1.9	0.001 *	2.6	0.003 ***
Debt ('000 Rs.)	1.5	0.043	0.2	0.033	1.5	0.035	1	0.076
Percentage of food purchased in the past 365 days	-2.1	-0.001 **	-2	-0.004 **	0.3	0	-2.4	-0.005 **
(D) Family belongs to the bottom 40% of households in the village	-2.1	-0.031 **	-1.5	-0.107				
(D) Farmer is illiterate	2.4	0.041 **	2.1	0.105 **	-3	-0.088 ***	-2.6	-0.176 **
(D) The most educated member of the family is illiterate	0.4	0.007	0.7	0.049	0.6	0.017		
(D) Scheduled Caste or Tribe	3.4	0.159 ***	2.6	0.465 ***	1.7	0.063 *	1.6	0.171
Risk aversion to open market prices	-0.9	-0.006	-0.1	-0.004	-5	-0.001 ***	-2.5	-0.001 **
Combined Risk Score (for commodity-specific control farmers)	-9	0 ***	-7.1	-0.001 ***	0.3	0.033	0.5	0.091
Ratio of coefficient of variation	0.4	0.043	-0.1	-0.059	-0.6	-0.107	-1.1	-0.422
Ratio of mean returns	0.6	0.004	0.5	0.011	2.6	0.07 ***	3.4	0.242 ***
Difference in skewness	0.1	0.001	0.6	0.022	-	-	-	-
(D) FOSD	-2	-0.062 **	-3.7	-0.323 ***	-	-	-	-
(D) SOSD	1.5	0.038	4.2	0.244 ***	-	-	-	-
Number of contract hamlets in the block	-0.4	-0.001	-1.9	-0.044 *	0.6	0.005	0.8	0.017
Number of contract villages in the block	-	-	-	-	-0.4	-0.01	-1.2	-0.038
Sunk Cost (Rs.'00,000)	-	-	-	-	4.2	0.9 ***	4	0.3 ***
Constant	-0.8		1		-3	***	-0.5	
Log pseudolikelihood	-38.95		-32.28		-58.16		-56.2	
N	465		125		465		138	
Proportion of observations classified correctly	96		88		94		88	
Likelihood Ratio	LR(22)=275.9		LR(15)=108.3		LR(20)=237.5		LR(18)=274	
p-value	0 ***		0 ***		0 ***		0 ***	
Pseudo R2	0.78		0.63		0.67		0.40	
Clusters	86		18		86		45	

Significance levels : * : 10% ** : 5% *** : 1%

[1] AME refers to Average Marginal Effects.

[2] (D) refers to dummy variables that equal 1 if the description is valid and 0 otherwise.

[3] For details on computation of combined risk scores, see Chapter 7.

[4] FOSD is a dummy variable that equals 1 if the subjective net returns from contracting first order stochastically dominates not contracting; SOSD is a dummy variable that equals 1 if the subjective net returns from contracting second order stochastically dominates not contracting.

[4] Risk aversion to open market prices denotes the coefficient of risk aversion computed from the bid or asking price of risk elicited in the survey multiplied by the coefficient of variation of the alternative /spot market price of the contract commodity in question.

[5] The dummy on whether or not the household belong to the bottom quintile is an investigator-recorded perception of relative status of the household in the hamlet surveyed.

Table 8.11: The Effect of Accounting for Regional Selection: Gherkins Phases 1 and 2

	Gherkins Phase 2				Gherkins Phase 1			
	ρ_c		$\rho_{c/v}$		ρ_c		$\rho_{c/v}$	
Explanatory Variable	Z-statistic	AME	Z-statistic	AME	Z-statistic	AME	Z-statistic	AME
Land owned (acres)	0.01	0.001	-0.75	0	-0.69	-0.004	2.04	0.008 **
Distance from nearest surfaced road (kms)	1.33	0.001	2.18	0.15 **	-6.01	0 ***	-3.25	-0.0001 ***
Distance from the nearest wholesale market (kms)	-0.03	0	-0.61	0	2.73	0.003 ***	2.17	0.004 **
Percentage of operated land irrigated	0.34	0	0.63	0	0.48	0	0.34	0.0002
(D) Rainfed farm	2.11	0.023 **	-0.55	-0.06	0.72	0.026	0.52	0.0313
Age (years)	-1.76	0.001 *	-1.51	-0.01	-0.25	0	0	0
Household size	2.65	0.002 ***	0.92	0.01	1	0.007	0.67	0.0076
Percentage of annual income from cultivation	1.8	0.001 *	1.57	0	1.44	0.001	2.23	0.0016 **
Debt ('000 Rs.)	-1.56	0.054	-2.36	-0.68 **	1.19	0	1.19	0.0003
Percentage of food purchased in the past 365 days	1.26	0.001	1.31	0	-0.9	-0.001	-1.01	-0.0012
(D) Family belongs to the bottom 40% of households in the village	2.36	0.011 **	0.87	0.06	0.07	0.003	-0.35	-0.0241
(D) Farmer is illiterate	0.73	0.012	0.3	0.02	0.41	0.023	0.7	0.0677
(D) The most educated member of the family has studied beyond high school	0.89	0.011	2.42	0.12 **	-0.13	-0.003	-0.19	-0.0071
Risk aversion to open market prices	3.69	0.03 ***	2.51	0.58 **	0.41	0.053	0.68	0.1629
Combined Risk Score (for commodity-specific control farmers)	0.43	0	0.67	0	-2.65	-0.001 ***	-2.96	-0.001 ***
Ratio of coefficient of variation	6.94	0.025 ***	2.44	0.4 **	1.91	0.029 *	0.99	0.0197
Ratio of mean returns	1.12	0.002	0.94	0.01	1.9	0.006 *	1.71	0.0065 *
Difference in skewness	-2.46	0.015 **	-2.12	-0.13 **	-0.95	-0.016	-0.83	-0.0209
(D) FOSD	0.12	0.049	-0.35	-0.07	0.13	0.01	-0.11	-0.0122
(D) SOSD	0.03	0.046	0.01	0	0.04	0.003	-0.03	-0.0034
Number of contract hamlets in the block	1.27	0.002	-0.21	0	1.7	0.004 *	0.16	0.0008
Sunk Cost (Rs.)	2.05	0.01 **	2.01	0.6 **	0.32	0	0.05	0.04
Constant	-8.27	***	-3.88	***	-1.69	*	-1.24	
Log pseudolikelihood	-71.63		-59.19		-89.4		-81.83	
N	465		120		339		191	
Proportion of observations classified correctly	92		74		89		82	
Likelihood Ratio	LR()=		LR(6)=46.8		LR(20)=63.2		LR(12)=29.7	
p-value	0		0 ***		0 ***		0 ***	
Pseudo R2	0.57		0.28		0.2611		0.1536	
Clusters	86		8		22		14	

Significance levels : * : 10% ** : 5% *** : 1%

[1] AME refers to Average Marginal Effects.

[2] (D) refers to dummy variables that equal 1 if the description is valid and 0 otherwise.

[3] For details on computation of combined risk scores, see Chapter 7.

[4] FOSD is a dummy variable that equals 1 if the subjective net returns from contracting first order stochastically dominates not contracting; SOSD is a dummy variable that equals 1 if the subjective net returns from contracting second order stochastically dominates not contracting.

[4] Risk aversion to open market prices denotes the coefficient of risk aversion computed from the bid or asking price of risk elicited in the survey multiplied by the coefficient of variation of the alternative /spot market price of the contract commodity in question.

[5] The dummy on whether or not the household belong to the bottom quintile is an investigator-recorded perception of relative status of the household in the hamlet surveyed.

Table 8.12: The Effect of Accounting for Regional Selection: Cotton and Papaya

	Cotton				Papaya			
	ρ_c		$\rho_{c/v}$		ρ_c		$\rho_{c/v}$	
Explanatory Variable	Z-statistic	AME	Z-statistic	AME	Z-statistic	AME	Z-statistic	AME
Land owned (acres)	-1	-0.004	-2.28	-0.023 **	0.07	0	0.55	0.002
Distance from nearest surfaced road (kms)	2.23	0.002 **	1.62	0	-0.15	0	-0.97	-0.006
Distance from the nearest wholesale market (kms)	1.09	0	5.48	0.04 ***	-0.94	0	-1.42	0
Percentage of operated land irrigated	1.81	0.001 *	1.36	0.001	-0.65	0	-1.12	-0.001
(D) Rainfed farm	0.59	0.026	1.22	0.06				
Age (years)	-2.74	-0.005 ***	-4.15	-0.012 ***	-0.07	0	-0.64	-0.002
Household size	-6.83	-0.035 ***	-2.55	-0.051 ***	-3.12	-0.018 ***	-1.49	-0.03
Percentage of annual income from cultivation	-2.26	-0.002 **	-1.77	-0.003 *	-0.86	0	-0.77	-0.001
Debt ('000 Rs.)	0.52	0	-0.04	0	-2.13	-0.504 **	-3.21	-1.966 ***
Percentage of food purchased in the past 365 days	1.43	0.001	0.74	0.001	3.06	0.003 ***	3.29	0.007 ***
(D) Family belongs to the bottom 40% of households in the village	-1.8	-0.057 *	-1.17	-0.116	-2.87	-0.039 ***	-2.12	-0.102 **
(D) Farmer is illiterate	-0.26	-0.012	-0.37	-0.049	-1.89	-0.073 *	-1.86	-0.156 *
(D) The most educated member of the family is illiterate	1.17	0.135	1.39	0.314	-1.03	-0.029	-1.86	-0.148 *
(D) Scheduled Caste or Tribe	-0.62	-0.037	0.95	0.194	3.23	0.121 ***	2.57	0.227 ***
Risk aversion to open market prices	2.34	0.115 **	0.37	0.026	-3.53	-0.029 ***	-0.9	-0.027
Combined Risk Score (for commodity-specific control farmers)	-0.26	0	-0.31	0	-1.54	0	-1.48	0
Ratio of coefficient of variation	0.72	0.065	-0.2	-0.026	1.65	0.358 *	0.89	0.286
Ratio of mean returns	1.94	0.024 *	1.24	0.022	-	-	-	-
Difference in skewness	-0.14	-0.001	3.11	0.055 ***	-1.89	-0.029 *	-1.98	-0.061 **
(D) FOSD	-0.94	-0.093	-0.27	-0.037	-	-	-	-
(D) SOSD	0.79	0.114	-0.01	-0.002	-	-	-	-
Number of contract hamlets in the block	2.96	0.019 **	1.72	0.017 *	-3.98	-0.083 ***	-0.67	-0.037
Number of contract villages in the block	-	-	-	-	4.04 ***	0.261	0.27	0.047
Sunk Cost (Rs. '00,000)	-	-	-	-	-0.69	0	4.27	0.2 ***
Constant	-1.46		1.7 *		-1.65	*	0.06	
Log pseudolikelihood	-88.14		-70.24		-73.59		-59	
N	339		148		465		170	
Proportion of observations classified correctly	87		76		92		84	
Likelihood Ratio	LR(21)=137		LR(7)=58.6		LR(20)=236.3		LR(20)=110.99	
p-value	0 ***		0 ***		0 ***		0 ***	
Pseudo R2	0.44		0.29		0.62		0	
Clusters	22		8		86		30	

Significance levels : * : 10% ** : 5% *** : 1%

[1] AME refers to Average Marginal Effects.

[2] (D) refers to dummy variables that equal 1 if the description is valid and 0 otherwise.

[3] For details on computation of combined risk scores, see Chapter 7.

[4] FOSD is a dummy variable that equals 1 if the subjective net returns from contracting first order stochastically dominates not contracting; SOSD is a dummy variable that equals 1 if the subjective net returns from contracting second order stochastically dominates not contracting.

[4] Risk aversion to open market prices denotes the coefficient of risk aversion computed from the bid or asking price of risk elicited in the survey multiplied by the coefficient of variation of the alternative /spot market price of the contract commodity in question.

[5] The dummy on whether or not the household belong to the bottom quintile is an investigator-recorded perception of relative status of the household in the hamlet surveyed.

i.e., the statistically significant characteristics are those that one would associate with the hilly regions in peninsular India. Villages within these tracts are scattered around a handful of urban centers, these blocks tend to be more sparsely populated than those in the plains. The availability of cultivated land per household is low, owing to parts that are thickly forested. However, the contracting region is also characterized by a predominance of (rainfed) agriculture, represented by the higher proportion of land that is cultivated. Block selection is also positively associated with the percentage of workforce whose main occupation is agricultural labor. Within these blocks, the firms choose villages where availability of cultivated land per household is higher, and those that are less remote, in terms of distance to the nearest town. It is interesting to see how the same attribute, nearness to a town, works in opposing ways at different stages of selection. While marigold contracting is prevalent in blocks where villages are scattered so that, on an average, villages are farther away from the nearest town than in non-contract blocks, within a block firms choose villages close to urban centers. There are obvious reasons for this choice. The distance from the nearest town is a proxy for road infrastructure and choosing villages closer towns makes it easier for the firm to evacuate contracted volumes, just as it lowers the costs associated with delivering inputs and monitoring.

A similar pattern of block and village selection is evident with papaya contracting (Table 8.15). Here, the papaya firm tends to contract in blocks where villages are, on an average located farther away from towns amid sparsely populated blocks, and yet within a block tend to choose villages that are closer to towns. In the case of papaya, the collection centers for latex are located close to towns, but firm officials suggest that the location of the latex collection point is established after they identify farmers who contract for supplying latex. The firm's selection of village is associated positively with the irrigation facility in a village as indicated by the percentage of cultivated land that is irrigated.

The spatial selection for gherkins procurement indicates a greater preference for blocks where average cultivable per household is small, where family sizes are large or where a relatively larger proportion of the workforce are agricultural laborers, reflecting, perhaps, the labor demands required for gherkins cultivation (Tables 8.16 and 8.17). Within blocks, firms seem to choose

villages that are farther away from the town or those populated predominantly by those from marginalized castes. Indeed, even within the surveyed villages, during the survey, it was apparent that the hamlets where contract farmers were located tend to be remote or populated by particular social groups belonging to the Scheduled Castes and Tribes. The selection of tracts for gherkins in Phase 1 and 2 are broadly and fundamentally consistent, even though coefficients (and their statistical significance) on particular variables are different.

At the time of the survey, cotton contracting was concentrated highly in a few blocks in Coimbatore district and given that this was the last season of operation it represents the vestiges of a scheme Table 8.18. A large number of blocks located in Salem district had just been dropped by the firm. This clustering around Coimbatore city is reflected in the selection of blocks with the average distance of villages being lower in the contracting blocks. Within the block, selection of villages is associated with lower literacy but higher average income per household. Villages where the average cultivated land per household was smaller were more likely to be contract villages.

Despite the fact that the models estimating spatial selection do not include variables for specific agro-climatic characteristics, these models fit the data well and are consistent with sample firms' description of their locational preference.

8.5.2 Farmer Characteristics

Across schemes, farmer level estimations of correlates of participation affirm that farmer perceptions of the risk and returns of contracting, relative to a next best alternative, matter. While different measures representing these are significant for the different contract commodities, the signs on the coefficients that are statistically significant are intuitive. The higher the perceived net incremental risk associated with contracting, as expressed by the risk scores, the less the likelihood of a farmer contracting. The higher the ratio of expected mean returns to contracting over that for a next best alternative, the greater the probability of a farmer contracting. The variable representing interaction between the estimated coefficient of risk aversion and the coefficient of variation of the contract commodity's price in the alternative market is associated positively with contracting

Table 8.13: Spatial Selection: Broiler

	Block selection		**Village selection**	
Explanatory Variables	Z-statistic	AME	Z-statistic	AME
Total number of cultivators	0.15	0	-2.16 **	0.000
Proportion of land under cultivation (% of all land)	1.78 *	0.000	3.14 ***	0.000
Proportion of land not available for cultivation (% of all land)			3.02 ***	0.681
Proportion of land not available for cultivation	-1.03	-0.258	0.07	0.020
Average cultivated land per household (acres)	2.67 ***	0.310	-2.96 ***	-0.174
Main cultivators (% of total workforce)	-0.86	-0.006	2.19 **	0.007
Agricultural labor (% of total workforce)	-0.4	-0.001	-1.81 **	-0.002
Average household size	-0.27	-0.019	1.65	0.120
Proportion of cultivated land that is irrigated (%)	0.12	0.000	1.42	0.001
Population density (persons/acre)	-1.21	-0.020	-2.99 ***	-0.067
Literacy Rate (% of total population)	0.09	0.000	-0.01	0.000
Scheduled Caste /Tribe population (% of total population)	-0.28	-0.001	0.78	0.001
Average distance of villages from their nearest town (kms)	-2.96 ***	-0.013	-1.55	-0.004
Average income per household per year (Rs. 00000)	1.51	0	-2.25 **	-0.006
Constant	-0.4		-2.05 **	
N	108		293	
Proportion of observations classified correctly	95		82	
Wald statistic	χ^2_{13}=43.34		χ^2_{14}=30.35	
p-value	0.00***		0.01***	
Pseudo R2	0.51		0.15	
Log pseudolikelihood	-17.56		-118.67	
Clusters	-		292	

Significance levels : ∗ : 10% ∗∗ : 5% ∗ ∗ ∗ : 1%

[1] AME refers to Average Marginal Effects.
[2] Blank cells indicate that the explanatory variable was not included in the regression.

Table 8.14: Spatial Selection: Marigold

	Block selection		**Village selection**	
Explanatory variable	Z-statistic	AME	Z-statistic	AME
Proportion of not land under cultivation (% of all land)			-0.97	-0.159
Average cultivated land per household (acres)	-4.74 ***	-0.246	2.44 **	0.232
Total number of households	-0.99	0		
Total number of cultivators	0.28	0		
Proportion of land under cultivation (% of all land)	4.01 ***	0.240		
Main cultivators (% of total workforce)	1.35	0.002	0.94	0.008
Agricultural labor (% of total workforce)	3.64 ***	0.002	0.6	0.001
Average household size	-1.61	-0.047	1.49	0.337
Proportion of cultivated land that is irrigated (%)	-3.22 **	-0.001	-2.72 ***	-0.010
Population density (persons/acre)	-1.97 **	-0.021	1.85 *	0.083
Scheduled Caste /Tribe population (% of total population)	-1.11	-0.001	-1.34	-0.002
Average distance of villages from their nearest town (kms)	2.74 ***	0.006	-2.63 ***	-0.007
Average income per household per year (Rs.)	3.34 ***	0		
Constant	1.58		-1.39	
N	108		40	
Percentage of responses classified correctly	99.2		92.5	
Wald statistic	$\chi^2_{12} = 34.69$		$\chi^2_9 = 29.49$	
p-value	0 ***		0 ***	
Pseudo R2	0.41		0.73	
Log pseudolikelihood	-5.91		-5.43	
Clusters			40	

Significance levels : $*$: 10% $**$: 5% $***$: 1%

[1] AME refers to Average Marginal Effects.
[2] Blank cells indicate that the explanatory variable was not included in the regression.

Table 8.15: Spatial Selection: Papaya

	Block selection		**Village selection**	
Explanatory variable	Z-statistic	AME	Z-statistic	AME
Total number of households			0.67	0
Total number of cultivators	-0.39	0	0.82	0
Proportion of land under cultivation (% of all land)	1.94 *	0.52	-0.53	-0.06
Proportion of land not available for cultivation (% of all land)	1.74 *	0.51	-1.03	-0.11
Average cultivated land per household (acres)	-2.36 **	-0.85	0.04	0.00
Main cultivators (% of total workforce)	0.27	0.00	0.38	0.00
Agricultural labor (% of total workforce)	1.95 *	0.01	0.1	0.00
Average household size	0.16	0.02	0.76	0.03
Proportion of cultivated land that is irrigated (%)	-0.13	0.00	1.85 *	0.00
Population density (persons/acre)	-1.98 **	-0.07	-0.27	0.00
Literacy Rate (% of total population)	0.35	0.00	-0.44	0.00
Scheduled Caste /Tribe population (% of total population)	-0.78	0.00	0.69	0.00
Average distance of villages from their nearest town (kms)	2.36 **	0.01	-1.91 *	0.00
Average income per household per year (Rs.)	0.1	0	-0.71	0
Constant	-0.65		-1.53	
N	108		239	
Percentage of responses classified correctly	90.8		93.3	
Wald statistic	$\chi^2_{14} = 21.91$		$\chi^2_{14} = 14.48$	
p-value	0.08 *		0.1 *	
Pseudo R2	0.24		0.1	
Log pseudolikelihood	-27.02		-52.66	
Clusters			237	

Significance levels : $*$: 10% $**$: 5% $***$: 1%

[1] AME refers to Average Marginal Effects.
[2] Blank cells indicate that the explanatory variable was not included in the regression.

Table 8.16: Spatial Selection: Gherkins Phase 2

	Block selection		**Village selection**	
Explanatory variable	Z-statistic	AME	Z-statistic	AME
Total number of cultivators			1.71 *	0.00
Total number of households			0.48	0
Proportion of land not available for cultivation (% of all land)	1.83 *	0.382	2.85 ***	0.515
Proportion of land under cultivation (% of all land)	1.11	0.288	1.41	0.328
Average cultivated land per household (acres)	-1.05	-0.221	-2.47 **	-0.290
Main cultivators (% of total workforce)	-0.55	-0.004	-0.27	-0.001
Agricultural labor (% of total workforce)	2.73 ***	0.005	-1.1	-0.001
Average household size	2.94 ***	0.351	1.58	0.097
Proportion of cultivated land that is irrigated (%)	-0.32	0.000	-2.31 **	-0.002
Population density (persons/acre)	-0.71	-0.013	-1.77 *	-0.031
Literacy Rate (% of total population)	1.4	0.010	0.21	0.001
Scheduled Caste /Tribe population (% of total population)	-2.77 ***	-0.015	1.74 *	0.003
Average distance of villages from their nearest town (kms)	0.34	0.002	1.18	0.003
Average income per household per year (Rs.)	1.7 *	0	-0.25	0
Constant	-2.41 **		-1.98 **	
N	108		232	
Percentage of responses classified correctly	95		90	
Wald statistic	χ^2_{12}=24.15		χ^2_{12}=38.83	
p-value	0.02 ***		0 ***	
Pseudo R2	0.56		0.35	
Log pseudolikelihood	-10.26		-46.98	
Cluster			231	

Significance levels : ∗ : 10% ∗∗ : 5% ∗ ∗ ∗ : 1%

[1] AME refers to Average Marginal Effects.
[2] Blank cells indicate that the explanatory variable was not included in the regression.

Table 8.17: Spatial Selection: Gherkins Phase 1

	Block selection		**Village selection**	
Explanatory variable	Z-statistic	AME	Z-statistic	AME
Total number of cultivators			2.1 **	0.00
Total number of households			-0.78	0
Proportion of land not available for cultivation (% of all land)	1.4	0.58	-0.41	-0.05
Proportion of land under cultivation (% of all land)	-0.37	-0.10	-0.1	-0.02
Average cultivated land per household (acres)	-1.71 *	-0.73	-1.02	-0.04
Main cultivators (% of total workforce)	1.26	0.01	-1.05	0.00
Agricultural labor (% of total workforce)	2.19 **	0.01	0.02	0
Average household size	3.12 ***	0.43	2.34 **	0.08
Proportion of cultivated land that is irrigated (%)	-1.55	0.00	0.44	0.00
Population density (persons/acre)	-1.36	-0.07	-1.57	-0.03
Literacy Rate (% of total population)	1.34	0.01	-0.48	0.00
Scheduled Caste /Tribe population (% of total population)	-0.91	0.00	0.62	0.00
Average distance of villages from their nearest town (kms)	-0.58	0.00	1.8 *	0.00
Average income per household per year (Rs.)	1.6	0	1.24	0
Constant	-2.71 ***		-1.63	
N	108		197	
Percentage of responses classified correctly	93		89	
Wald chi2(12)	$\chi^2_{12} = 16.22$		$\chi^2_{14} = 26.96$	
p-value	0.1 *		0.02 **	
Pseudo R2	0.39		0.22	
Log pseudolikelihood	-17.36		-52.29	
Clusters			195	

Significance levels : $*$: 10% $**$: 5% $***$: 1%

[1] AME refers to Average Marginal Effects.
[2] Blank cells indicate that the explanatory variable was not included in the regression.

Table 8.18: Spatial Selection: Cotton

	Block selection		**Village selection**	
Explanatory variable	Z-statistic	AME	Z-statistic	AME
Proportion of land not available for cultivation (% of all land)			-0.84	-0.437
Proportion of land under cultivation (% of all land)	1.86	0.527	-0.32	-0.172
Total number of households	-0.48	0	-0.37	0
Total number of cultivators	0.66	0	0.47	0.000
Average cultivated land per household (acres)	-0.63	-0.105	-1.74 *	-0.180
Main cultivators (% of total workforce)	-0.13	-0.001	-0.74	-0.008
Agricultural labor (% of total workforce)	1.56	0.004	-0.15	0.000
Average household size	0.79	0.081	1.35	0.232
Proportion of cultivated land that is irrigated (%)	-1.12	-0.001	0.86	0.002
Population density (persons/acre)	-2.08 **	-0.086	-1.18	-0.014
Literacy Rate (% of total population)	-1.78 *	-0.008	-3.27 ***	-0.017
Scheduled Caste /Tribe population (% of total population)	-1.17	-0.006	-1.35	-0.004
Average distance of villages from their nearest town (kms)	-1.9 *	-0.011	-0.97	-0.006
Average income per household per year (Rs. '0,000)	-0.38	0	2.64 ***	0.002
Constant	0.37		0.27	
Percentage of responses classified correctly	97.56		86.54	
N	108		104	
Wald chi2(13)	26.79		47.11	
p-value	0.01 **		0 ***	
Pseudo R2	0.5		0.35	
Log pseudolikelihood	-11.5		-32.9	
Clusters			104	

Significance levels : ∗ : 10% ∗∗ : 5% ∗ ∗ ∗ : 1%

[1] AME refers to Average Marginal Effects.
[2] Blank cells indicate that the explanatory variable was not included in the regression.

status, suggesting that farmers who are more risk averse are likely to contract or given risk aversion, a larger variation in market prices lead farmers to contract.

Not only do these results validate the concerns raised in Chapter 7 that farmer perceptions of risk matter, they also corroborate the view that contracting is indeed a two-way, matching problem, where farmers have agency.

In the case of skewness measures and stochastic dominance, the results are somewhat variable. One would expect that the difference in skewness between expected returns from contracting and its next best alternative is linked negatively to contracting status. The higher the difference in skewness, the greater the likelihood of windfalls when not contracting. This implies that those who want to exploit these spikes in the spot market are less likely to contract. This is true of gherkins (phase 2) and papaya, but in the case of cotton, this coefficient has a positive sign. For other commodities, skewness does not seem to be statistically significant. As for stochastic dominance, when contracting stochastic dominates not contracting, the likelihood of contracting ought to be higher. The reverse seems to be the case, wherever the variable is statistically significant, for example, marigold. This somewhat puzzling result in the case of marigold for example could be owing to the porosity of contract and non-contract channels for the contract farmers. As Chapter 11 discusses, many marigold farmers contract cannily, expecting to divert some of the contracted volumes to the spot market when prices shoot up. It is possible that the data on expected returns distributions from contracting incorporates this phenomenon, leading to unexpected signs on the stochastic dominance coefficients.

That different commodities make different demands on farmers is well known. Additionally, in the context of a developing country, and in the absence of strong public enforcement through the courts, firms often look for farmer characteristics that minimize their risks of contracting and costs, achieved partly though picking farmers capable of getting higher yields. These attributes naturally differ depending on the nature of the commodity and the firm itself.

Of the contract commodities studied, papaya and broiler require investments up front. Broiler growers invest in sheds, drinkers and feeders for the birds, and papaya growers need to ensure that basic irrigation facilities are in place. Gherkins farmers too tend to invest in spraying machines as

the crop demands high pesticide application. Consequently, for all these crops, these investments by the farmer potentially increases the likelihood of being offered contracts by the firm (Tables 8.16, 8.15, 8.13 and 8.17). In the case of marigold and cotton, there is practically no investment upfront.

Papaya contracting is associated with farmers who are more literate, and who are among the better off in the village, who are less indebted and have a greater market orientation (with a greater proportion of food being purchased rather than consumed). Those belonging to the Scheduled Castes are more likely to be selected.

The likelihood of a farmer being offered broiler contracts is higher when the farmer is literate, but also when the proportion of annual income is derived from cultivation is higher. Farmers often contract for broiler owing mainly to constraints on water availability that impinges on their ability to grow field crops. However, even when there is no such constraint, farmers often opt for poultry since, in their words, it is almost like receiving a salary, bringing in regular income throughout the year.

In the case of cotton, farmers with smaller landholdings and smaller families are associated with greater likelihood of contracting. Younger farmers appear to be more likely to contract. Interestingly, the farther away a farmer is from the nearest wholesale market the more likely the farmer contracts for cotton. Given that cotton has a spot market that makes sideselling feasible, and the fact that farmers are scattered, it could well be the case that the scheme's last season hinged on those for whom costs of sideselling were relatively high.

Farmers who have a higher likelihood of participating in marigold contracting appear to also be illiterate, from marginalized social groups, have larger families and work rainfed farms. However, the larger the land owned and less the proportion of annual income derived from agriculture the greater the likelihood of contracting.

For the gherkins scheme across the two phases, interestingly, there is not much consistency in the drivers of selection. For instance, while in Phase 1, farmers who had better road access are more likely to contract whereas the opposite holds true for the sample in Phase 2. This is partly on account of the seasonal differences in sources of procurement. Phase 1 was conducted in the summer

whereas Phase 2 was conducted in the winter months. Further, the sample firm had dropped areas close to the plant owing to the stiff competition from other gherkins processors in the same region. The switch in the drivers might be on account of this shift. According to the sample firm, each firm was providing cash advances to the farmer in order to attract participation and matching the competitor's cash advance became increasingly difficult to sustain.[17]

The evidence across crops on the drivers of selection suggests that there is much heterogeneity across crops, even as there are some elements shared across schemes (risk perceptions, for example). This reinforces scholarly opinion that suggest there is considerable diversity and context specificity in who participates. The value of this evidence is that such heterogeneity is present even within a contiguous area with the same political administrative structure.

8.5.3 Levels of Sorting

The selection decomposition exercise allows for a simple comparison of the contribution of spatial selection or the domain layer and the contribution of farmer selection at the matching stage. To do this, I use the nearest neighbor matching method, where each observation belonging to the group of farmers that contracts for a commodity is matched up with an observation from the group of farmers who do not contract with the commodity, on the basis of the closeness of predicted constituent probabilities. The average difference in the predicted probability of the other constituent probabilities is computed.[18] For example, to estimate the difference in the estimated predicted probabilities that a block or village is selected, observations are matched on the basis of the closeness of the estimated predicted probability of a farmer being selected, given that the block or village is selected. Thus, to examine how significant the aspect of spatial selection or the domain layer is, each non-contract farmer is matched up with a contract farmer such that both share the same predicted probability of participating, given their village is selected (i.e., based on predicted $\rho_{c/v}$). The difference in predicted probabilities of village selection and of block selection is computed. In other words, the average difference between predicted $\rho_{v/b}$ is computed for village level exclusion and the average difference between ρ_b gives the difference in sorting at the block

[17] Agribusiness Survey, November 2007, Dindigul, Tamil Nadu.
[18] This is implemented using the nnmatch command in STATA (Abadie et al., 2004).

level. For sorting at the farmer level, the matching is made on the basis of predicted probabilities of both estimated predicted $\rho_{v/b}$ and ρ_b. The average difference between predicted probability of the farmer being selected ($\rho_{c/v}$) across contract and non-contract farmers is computed to produce an estimate of farmer level sorting. Given that the data constitutes predictions that are estimated as part of the selection decomposition exercise, there is a prediction error associated with the variables used for matching as well as those used to compute the differences. The estimation hence allows for biases in matching. In addition, the standard errors correct for heteroscedasticity. Table 8.19 presents data on the difference in probabilities that are associated with the sample farmers for the five commodities. Whenever the difference in estimated predicted probability of the block or village being selected is statistically significant, given matching or comparable predicted probabilities that the farmer is selected, one can infer that there is significant domain level or spatial level sorting. So too, if the difference in estimated predicted probability of the farmer being selected is statistically significant given matching propensities for block and village selection, it implies that farmer level sorting is relevant in the process of selection.

The table suggests that contracting status relates significantly to both region level sorting as well as farmer level sorting. This is true for most cases. In the gherkins sample from phase 2, however, sorting at the region (at the block level) appears to be significant, while for papaya, farmer level sorting appears to be significant. This implies that for gherkins, exclusion of geographies might be relevant and given a shared propensity for a block to be selected, the farmer level exclusion is less of an issue. In the case of papaya, it appears that farmer level selection is a key driver. This is consistent with the contracting firms' approaches to selection, where gherkins firms follow a cluster approach, choosing villages. In papaya, in contrast, social contact drives most initiation of contractual relationships, and farmers are scattered fairly widely. Also, papaya needs significant upfront investments and enterprise, the firm is perhaps discerning in its choice of contract farmers.

8.6 Concluding Remarks

The method of selection decomposition discussed so far was motivated by a discontent with the use of farm size as a dominant theoretical category for assessing farmer participation and its use

Table 8.19: Levels of Sorting: Farmer versus Domain Selection Assessed using a Simple Matching Estimator

Exclusion at what level?	**Differences in average predicted probability at region level**		**Differences in average predicted probability at farmer level**
Commodity	**Village**	**Block**	**Farmer**
(1)	(2)	(3)	(4)
Marigold	0.46***	0.2 ***	0.30 ***
Papaya	0.02*	0.02	0.34 ***
Broiler	0.21 ***	0.63 ***	0.47 ***
Cotton	-0.07 ***	0.06 ***	0.16 ***
Gherkins (Phase 1)	0.01	0.15 ***	0.15 ***
Gherkins(Phase 2)	0.28***	0.64 ***	0.38***

Significance levels : $*$: 10% $**$: 5% $***$: 1%

[1] This is a simple matching estimator, implemented using nnmatch in STATA following Abadie et al. (2004).
[2] The matches are based on the predicted probabilities computed as part of the selection decomposition exercise. For the region level (columns 2 and 3) matching is on predicted $\rho_{c/v}$ and for the farmer level (column 4) matching of observations is based on predicted block and village selection, ρ_b and $\rho_{v/b}$ respectively.
[3] Since the matching is based on predicted values, the matching is corrected for possibly biased matching.
[4] The standard errors to compute statistical significance are corrected for heteroscedasticity.

and interpretation in modeling selection. Further, this chapter suggested that modeling selection as a layered process allows us to identify the level at which farmer exclusion from contract farming schemes occurs, as well as the differences in factors driving selection at multiple stages. The evidence suggests this might be an appropriate way to assess farmer participation. Furthermore the survey also points to diverse patterns across commodities. This emphasizes the virtue of getting away from generalized notion of contract farming and drivers of participation, focusing instead on contracting for specific commodities and to recognize that the nature of exclusion is more complex that in typically acknowledged in existing research on contract farming. Selection of farmers based on observable and unobservable farmer characteristics is only one aspect of selection. Spatial selection over a geographic domain by a contracting firm constitutes another important element in determining a farmer's contracting status. This has important implications for the level at which public policy interventions should operate.

Chapter 9

Assessing Welfare Gains

9.1 Introduction

The issue of welfare gains to participation in emerging supply chains has acquired much significance in recent times. Should participation in these chains lead to clear net welfare gains, it offers credible opportunities for farmers in developing countries to transform their livelihoods. The attempt to assess empirically if participation in contract farming schemes is associated with higher welfare is, however, fraught with several methodological and epistemological problems. Many methods have been evolved to address them. A clearer recognition, if not resolution, of these issues is essential, since such empirical evidence often provides the basis for policy advocacy for the promotion of smallholder participation in contract farming schemes.

This chapter brings together the issue of selection, participation and benefits to make particular welfare comparisons in the five commodity sectors studied. Do contracting farmers do better? How much do they stand to gain relative to their counterparts who do not participate? This study examines these questions, arguing for a more careful consideration of the particular nature of comparison for heterogeneous crops, especially when the treatment involves both a different crop and a different mode of transaction. It also calls for according a prominent place to the influence of farmers' risk perceptions in controlling for selection and participation while making such welfare comparisons. In the context of the five commodities I study, the decision to contract often coincides with a decision to grow the contract commodity, which poses difficulties for separating the welfare gains from contracting versus that from growing a different crop. I adopt an endogenous switching model where farmers sort themselves into two regimes, contracting and not contracting, based, in part, by the perceived differential welfare gains between the two regimes. While this enables me to

estimate welfare implications of participation in the two regimes, it also allows me to identify the differential returns to factors across these regimes. My goal is therefore to examine, not merely the effect on a welfare metric but to see if different regimes reward key factors of production differently.

The chapter is organized as follows. I first outline the different empirical approaches to assessing welfare gains, following which I lay out in detail the approach I adopt and the justification for its use in the context of my work. After a description of the data, I present key results from estimation of the model, namely the incremental net profit associated with contracting. I then discuss briefly the structure of costs and returns to highlight the possible sources of gain and comment on the returns to key factors of production under contracting and not contracting, before concluding the chapter.

9.2 Empirical Approaches

Much of the recent literature on assessing welfare gains from contract farming (and more generally, modern supply chains) has focused on tackling the problem of selection. A direct comparison of welfare metrics based on contract participation could potentially lead one to conclude, for instance, that contract farmers do better, without acknowledging the possibility that it might be the higher ability farmers who participate.[1] An important challenge is therefore to account for factors that might implicitly influence both participation and the welfare outcomes. If these factors remain neglected then welfare gains might be wrongly attributed to participation, when in fact, they are due to competing factors that have been omitted from the model specification.

One empirical approach is to account for selection based on observables. Whenever selection of farmers into contract schemes is transparent or there is adequate understanding of the process, a model based on selection on observables could credibly and fully account for the selection effect. A common approach has been the use of Heckman's selection model to control for selection bias. Propensity score matching methods represent another similar approach. Maertens and Swinnen

[1]Many studies present simple comparisons, admittedly, without making claims of causal effects. Kumar (2007),Swain (2008),Rangi and Sidhu (2000),Haque and Birthal (1998) provide examples of contract farming in India. To the extent that these studies unpack the structure of costs and returns and the sources of welfare gains to contracting, they provide useful starting points for analysis.

(2009) use this to compute average treatment effect (ATE) where the treatment is participation in modern supply chains. Minten et al. (2009) only observe households who participate in contract farming, and so they resort to comparing households who participate in contract farming with households who do not participate in contract farming by constructing a control group from a different data set. In general, these approaches rest on the assumption that selection into treatment, i.e., participation in contract farming schemes, can be reliably based on observable characteristics (Dehejia and Wahba, 2002; Angrist and Pischke, 2009).

In many situations, this requires a leap of faith. A firm's selection of farmers to contract with and farmers' own choices on whether to contract or not are driven by their attitudes to risk, perceptions of the alternatives, and in the context of weak contract enforcement, on trustworthiness, reliability or reputation, referred to sometimes as 'social collateral'.[2] These are typically unobserved by the researcher, while firms and farmers tend to have relevant information or proxies in their information sets. While this problem is redressed somewhat by obtaining more and better information from surveys, alternate approaches provide ways to overcome this constraint.

In the Instrumental Variable (IV) approach, participation is instrumented for by a variable that is correlated with participation but not with the welfare outcome of interest. However, IV identification is still achieved only through the observable instruments, and hence inherits the same problems of Propensity Score methods or Heckman models.

Naturally, each of these approaches has relative merits and demerits and none can be singled out as the best across contexts. The selection on observables design, for instance, enables richer treatment of the selection process, often a question of considerable importance in its own right. On the other hand, where the survey data do not contain enough detailed information on drivers of selection, this can jeopardize the credibility of the results. In such cases, a selection on unobservables design is probably preferable.

The efficacy of these approaches invariably depends on the choice of an instrument that enables identification of the parameters of the model. As Bellemare (2010) elucidates, many instruments that have been used can be faulted for possibly being endogenous to the outcomes studied. Miyata

[2]Ch 8 discusses aspects of the selection process in detail.

et al. (2009) treat the distance between a respondents farm and the farm of the village chief as an instrument. Rao and Qaim (2011) use farmer group membership to serve as an instrument and Simmons et al. (2005) choose number of organizations farmers are members of as an instrument. Other instruments include the number of female laborers in the respondents household as well as a dummy for whether a female in the household is a member of a womens organization (Maertens and Swinnen, 2009). Bellemare (2010) makes innovative use of an experiment, deriving farmer willingness to pay (WTP) for a certain return from a randomly drawn level of investment. Across methods, the central challenge is to find an appropriate instrument that can break any correlation between selection and the unexplained variation in welfare outcomes. At the same time, instruments constructed in experimental settings need to be appropriate to the structural process of selection. For example, if WTP (for insurance, i.e., a certain income) is used to instrument for participation, the implicit assumption is that contracting offers a certain income, or at least insurance relative to no contract. If, as Chapter 7 suggests, however, contracting itself is something of a gamble, the instrument loses intuitive appeal, although its correlation with participation, even if spurious, could still contribute to identification.

9.2.1 Estimation strategy

The particular context of my work makes it imperative to spell out in detail the nature of welfare comparisons between contract and non-contract farmers. A reliable estimate of its impact hinges on the construction of an appropriate and valid counterfactual, which needs to be defined rigorously but in ways that faithfully factor in the empirical context.

In general, it is hard in the case of cotton, papaya and gherkins to separate the contracting effect from the cropping pattern effect. Farmers who participate and are selected are committing to both a mode of production and/or transaction and simultaneously to growing a new crop. Gherkin has no alternate spot market. A majority of cotton farmers in the study region express that the only way they would grow cotton is if it were under contract cultivation, preferring to grow tomato otherwise. The same is true for papaya, where, if farmers were not contracting, they would opt for other crops or other table varieties of papaya.

Even when there is an alternate domestic market, as in the case of marigold and broiler, the definition of the counterfactual can be challenging. If the identity of firms matter, then the treatment is not contract participation per se but contracting with one firm rather than another. Given that contractual practice, or what is contractual and what is not, is fuzzy on many aspects, if one admits the possibility that there is considerable diversity in the manner firms operate, even with similar terms of contract, crop or destination, it no longer makes sense to speak of a generalized notion of contracting.

Similarly, the counterfactual to contracting should ideally refer to farmers who supply to precisely the same markets and for the same purpose. In the case of marigold for instance, the firm contracts for extraction and the non-contract farmers sell in the fresh flower market, conflating these two implies that it is no longer clear if the welfare gains record the gains from distinguishing use or destination or whether it measures incremental benefits from contracting versus not contracting. It is essential therefore to distinguish between concluding that contracting benefits small farmers and concluding that supplying to export markets is more lucrative than to domestic markets. The recent literature on supermarket participation makes this distinction clear by framing the question differently, asking if farmers benefit from participating in modern supply chains rather than traditional channels (Minten et al., 2009; Maertens and Swinnen, 2009).[3]

Furthermore, even with comparisons for the same crop between contracting and a traditional channel, given the crop has the same use across channels, the character of the local market can be transformed by the presence of contracting on a large scale and this leads to different kinds of empirical problems, so that the general equilibrium effect on the local market can alter the returns to non-participants as well.

Thus, whenever contracting appears jointly with some other distinguishing characteristic, either in terms of destination, end use or varietal difference, the challenge is to measure of welfare impact

[3]In the context of India, there are several examples that suggest supplying for export markets yield higher returns than serving domestic markets. A study of Mahagrapes showed that profits earned per acre per annum by contract growers were nearly 38 percent higher than that for non-contract growers mainly because Mahagrapes serves global markets, and hence prices received are almost three times higher than in the local markets (Narrod et al., 2009).A similar case study of contract grape growers in Andhra Pradesh, also supplying the export market, showed that contract growers received 55 percent higher net returns than supplying to the domestic markets (Dev and Rao, 2005). For gherkins growers in Andhra Pradesh in 2004-05, returns over variable costs were 30 percent higher than for other vegetable crops (Dev and Rao, 2005).

of contracting per se, delinked from other coincidental attributes. In general, it is extremely difficult to isolate these impacts in survey data. This problem permeates each of the commodity sectors that is the subject of study.

The need to deal with this problem leads me to the following approach. The welfare metric I propose is net profit per acre. For contract farmers, whether or not it is the subject firm, this is the net profit per acre under the contract crop and for non-contract farmers, it is the net profit per acre either under the contract crop for an alternate market or under the crop they have chosen to be the closest substitute for the contract crop. This refers to the income earned from all main and byproducts of cultivation minus all paid out costs. This approach of accounting for costs is somewhat different from the cost concepts traditionally used in India (presented in Table 9.1). I combine a subset of components from A1 and A2, while adding a few others. First, fixed costs were not apportioned and rent on own land, farm assets and costs of family owned labor were not imputed. Second, transactions costs, specifically those included in transport and marketing were accounted for, given that this is often an important source of gains for contract farmers. The constituents of net profit per acre for the contract commodities in this study are presented in Table 9.2.[4] Farmers were thus simply asked for the net income they were left with per unit area of production at the end of the season, after paying out all production and transactions costs for the entire season, including multiple harvests.[5]

An exclusive focus on net profit per acre as a welfare measure, i.e. the assumption of separability, can be faulted for not taking the entire context of household decisions, the particular place of the contract commodity in a portfolio of crops or of its impact on other aspects of welfare. However, given that eliciting reliable data on incomes from households is notoriously difficult in the context of the study area, this was not pursued. Further, it is typical for farmers to treat the contract commodity as a cash crop substitute so that they allocate acreage either to the contract commodity

[4]For other crops, cited by farmers, as the next best alternative, the same components of costs are used and depending on the nature of the crop, the income is either from sale of flower, fruit or vegetable.

[5]An alternate welfare metric involves net profit per acre after accounting for imputed costs of family labor, depreciation of machinery and equipment, and fixed investments, including interest on working capital. Depreciation on fixed investment is set at 20% and on equipment at 10% following practice established by the Commission on Agricultural Costs and Prices (CACP) in India. This measure involves making a range of strong assumptions on parameters used to derive these and is hence not used as a welfare metric in this study. In general, imputed costs pose particular problems for empirical research .

Table 9.1: Cost Concepts

Cost Concept	**Includes**
A1	All actual expenses in cash and kind incurred in production by the producer. The items covered in cost A1 are costs on: (i) hired human labor, (ii) hired bullock labor, (iii) owned bullock labor, (iv) home produced/purchased seed, (v) plant protection chemicals, (vi) home produced/purchased manure, (vii) fertilizers, (viii) insecticides and pesticides, (ix) depreciation on farm machinery, equipment and farm building, (x) irrigation, (xi) land revenue, land development tax and other taxes, (xii) interest on working capital, (xiii) interest on crop loan, and (xiv) miscellaneous expenses.
A2	Cost A1 + Rent paid for leased-in land
B	Cost A1 + Interest on value of owned capital assets (excluding land)
B2	Cost B1 + Rental value of owned land (net of land revenue) and rent paid for leased-in land
C1	Cost B1 + Imputed value of family labor
C2	Cost B2 + Imputed value of family labor
C2	Cost C2 estimated by taking into account statutory or actual wage rate which ever is higher
C3	Cost C2+ 10 per cent of Cost C2 to (on account of managerial functions performed by farmer)

These concepts are defined by the Commission of Agricultural Costs and Prices (CACP), Government of India.

Table 9.2: Computation of Net Profit per acre for Contract Commodities

Cost Concept	**Income**	**Costs**
Gherkins	Income from sale of fruit	Farm yard manure + Seeds + Micronutrients +Plant protection+ Fertilizer application + Weeding + Land preparation + Seedbed preparation + Seed treatment + Intercropping expenses (if any) + Transport Costs + Commission + Female hired labor + Male hired labor
Marigold	Income from sale of flower	Same as above
Cotton	Income from sale of kapas	Same as above
Papaya	Income from latex and fruit	Same as above
Broiler	Income from sale of bird, poultry manure	Medicines + Electricity + Water charges + Charcoal + Cleaning Costs + Supplementary feed + Hired labor + Transport + Commission

[1] For broiler the chick and feed are provided by the firm across the industry, and hence does not constitute a cost incurred by the firm.

or to an alternate cash crop. The assumption that the contracting crop does not alter the essential nature of the entire portfolio of crops is therefore reasonable in this case.

For all the commodities, the net profit per acre was obtained for the entire cropping season. The aggregation over the season would account for multiple pickings or harvests and smoothen biases introduced by price volatility over the season. While this contributes to aggregation bias, it also makes inter-farmer comparisons more reliable. For perennials like papaya, data was obtained for the most recent month and for broiler, for the most recent completed cycle (comprising six weeks from chick to broiler). While farmers were typically encouraged to refer to any written accounts they had, in most cases, farmers relied on recall. The detailed costs and returns was obtained according to established protocols for collecting such data.[6] This approach enables crosschecks, both internally so that the different components derived through a detailed recording of quantity and price make sense, as well as across farmers growing the same commodity or in the same geographic region to ensure that such recall data was reliable.[7]

The other caveat, which holds for most studies of this nature, is that the net profit per acre recorded in the year of survey is one draw from a distribution, as illustrated in Chapter 7. It is therefore natural that these can be very different in different years, depending on a host of exogenous conditions such as weather, pest pressure and external market conditions. There is also a large variation across farmers. The results on welfare outcomes are therefore to be interpreted with caution. In the context of the larger work, this is in fact illustrative of heterogeneity of farmer experiences across time, contributing to the dynamics or life cycle of contracting schemes.

An endogenous switching regression (under known sample separation) offers a way to negotiate the difficulty in separating out a cropping pattern effect from the contracting effect.[8] The rationale for this is that selection into contracting puts farmers in different groups, associated with different profit streams. The survey data on net profits per acre collected for both contract and non-contract farmers implies that I observe sample outcomes, or draws, from both profit streams or

[6] as presented in question Section E, questions 24, 26,15, 14 in schedules 1(A), 1(B), 1(C) and 1(D) respectively.
[7] I also had access to cost of cultivation studies that provided benchmarks as crosschecks.
[8] Maddala (1983) discusses the endogenous switching regression approach in detail.

both regimes, presumably coming from different distributions. This is analogous to sorting into different occupations or into public and private sector employment.

I assume that this sorting is potentially endogenous, driven at least in part by the difference in the net profits per acre when contracting and not contracting.[9] This separates the sample into two streams, those that contract and those that do not. While this separation into two streams does not help isolate the cropping pattern effect from the contracting effect, it is now possible to account for specific elements of the contractual relationship to assess its impacts on the welfare metric for those who are sorted into the 'treatment' group. For example, controlling for inputs or supervision provided by the firm, etc., for those that are in the contracting regime, allows identification of the impact of contractual elements, given that the farmer is participating in the growing of a contract commodity. This approach is not only essential to overcome the difficulties in separating the crop switching effect from the contracting effect but it also draws attention to an important aspect that is often neglected in empirical work in contract farming. In estimating welfare metrics as functions of farmer characteristics, it is possible to compare the returns to particular factors of production across the two regimes. In other approaches that account for selection, since regimes are pooled by construction, they mask the differential structure in returns to factors of production and other covariates. In contrast, the switching regression approach allows for structural differences in the relative determinants of profitability.

This approach has been used in a variety of contexts. Among the earliest is an application by Lee (1978), examining the joint determination of the extent of unionism and the effects of unions on wage rates. This accounts for the interdependence of union membership and wage gain, wherein the latter can motivate workers to become members in the first place. Adamchik and Bedi (2000) study wage differentials in public and private sectors in Poland, wherein the choice of sector is partly determined by intersectoral wage differentials.Fuglie and Bosch (1995) study housing demand in Spain as do Manrique and Ojah (2003) to study differences in rental prices. Cadot et al. (2006) and Dutoit (2007) use this approach in the context of agriculture assessing the impact and ability of farmers to switch regimes, from subsistence farming to commercial agriculture in Madagascar.

[9]Exogenous factors drive participation too in terms of the selection process adopted by the firm that rations out farmers who might be willing to contract but are not offered contracts by the firm.

Cai et al. (2008) applies this to contract farming in Thailand and Rao and Qaim (2011) look at effect of supermarket participation on welfare of Kenyan farmers.

Suppose $\tilde{Y}_i$ represents a latent variable that marks the threshold that drives farmers to contract or not. While this is typically regarded as the expected utility from participation, here, it is treated as farmer i's net welfare gain from participation in contracting relative to the next best alternative. This latent subjective utility of a farmer i can be modeled as a function of covariates comprising individual farmer characteristics and perceptions and other hypothesized determinants of participation, denoted by W_i. As Chapter 7 elaborated, this includes not merely farmer perceptions of contracting in terms of relative expected means, but also relative moments of a higher order along with risk scores that capture perceptions of contracting that are difficult to monetize. W_i also includes constraints imposed on participation by the firm, for example in the firm's choice of villages to work in. This then becomes the basis of sorting farmers into the regimes, defining contracting status. Let I_i be the indicator variable representing contracting status (at the time of survey) of farmer i. This is given by

$$\begin{aligned} I_i &= \begin{cases} 1 & \text{iff } \tilde{Y}_i > 0, \\ 0 & \text{iff } \tilde{Y}_i \leq 0 \end{cases} \\ \tilde{Y}_i &= W_i\alpha + v_i \end{aligned}$$

The endogenous switching regression model then suggests that farmers who are seen to contract face a welfare outcome Y_{1i} from one distribution and those who do not contract face a draw Y_{2i} from possibly another distribution. The net profit per acre, the welfare outcome of interest, is determined by a set of explanatory variables, X_{1i} and X_{2i} that could be different across regimes.

$$
\begin{aligned}
Y_i &= \begin{cases} Y_{1i} & \text{iff } I_i = 1, \\ Y_{i2} & \text{iff } I_i = 0 \end{cases} \\
Y_{1i} &= X_{1i}\beta_1 + u_{1i} \\
Y_{2i} &= X_{2i}\beta_2 + u_{2i}
\end{aligned}
$$

Y_{1i} and Y_{2i} are only partially observed, since the former is observed only for those belonging to regime 1 and the latter only for those belonging to regime 2. What is observed is, in fact, Y_i. This set of equations describes in detail the structure of the model I estimate. The indicator variable takes 1 or 0 for contracting status. This is driven by a latent variable, which is modeled as a function of a set, W_i, of farmer specific characteristics, farmer perceptions of contracting as well as the firm's choice of regions from which to procure.

If Σ is the variance-covariance matrix for the error terms u_{1i}, u_{2i} and v_i. The diagonal terms in the matrix are the variances of the error terms, denoted by σ_j^2 where $j = 1, 2, v$ and the covariance terms are given by σ_{jl} where $j, l = 1, 2, v$ and $j \neq l$.

$$
\sum = \begin{pmatrix} \sigma_1^2 & . & . \\ \sigma_{12} & \sigma_2^2 & . \\ \sigma_{1v} & \sigma_{2v} & \sigma_v^2 \end{pmatrix}
$$

In this model, I assume that the following properties hold

$$
\begin{aligned}
&(1) \quad u_{ji} \sim N(0, \sigma_j^2), j = 1, 2 \\
&(2) \quad v_i \sim N(0, \sigma_v^2) \\
&(3) \quad \sigma_{12} = 0 \\
&(4) \quad \sigma_v^2 = 1
\end{aligned}
$$

Assumptions 1 and 2 are standard for Maximum Likelihood estimation methods, and the third assumption comes from the fact Y_{1i} and Y_{2i} are never observed together. In fact, this cannot usually

be estimated since it does not explicitly appear in the likelihood function and is usually treated as being equal to 0. The last assumption is typically made since α can only ever be estimated up to proportional scale.

We need to make additional assumptions here that

$$\sigma_{2v} \neq 0$$

$$\sigma_{1v} \neq 0$$

If these are zero, then there is exogenous switching. Typically this is tested via the correlation coefficients [10]

$$\begin{aligned} \rho_{1v} &= \frac{\sigma_{1v}}{\sigma_1 \sigma_v} \\ \rho_{2v} &= \frac{\sigma_{2v}}{\sigma_2 \sigma_v} \end{aligned}$$

The efficient way to estimate this model is via Full Information Maximum Likelihood (FIML) that estimates the entire set of equations at once.[11] Lokshin and Sajaia (2004) develop a module for implementation of this model in Stata.[12] Once the parameters are estimated, it is possible to calculate the following unconditional expectations,

$$\begin{aligned} E(Y_{1i}|X_{1i}) &= X_{1i}\beta_1 \\ E(Y_{2i}|X_{2i}) &= X_{2i}\beta_2 \end{aligned}$$

[10] The notation used here is distinct from those used in Chapter 8 to denote probabilities of selection of contract block, villages and farmers.

[11] The derivation of the likelihood function is presented in Appendix C.

[12] For a discussion see Dutoit (2008) and Lokshin and Sajaia (2004).

and conditional expectations,

$$\begin{aligned} E(Y_{1i}|I_i = 1, X_{1i}) &= X_{1i}\beta_1 + \sigma_1\rho_{1v}\lambda_1 \\ E(Y_{2i}|I_i = 1, X_{1i}) &= X_{1i}\beta_2 + \sigma_2\rho_{2v}\lambda_1 \\ E(Y_{1i}|I_i = 0, X_{2i}) &= X_{2i}\beta_1 - \sigma_1\rho_{1v}\lambda_2 \\ E(Y_{2i}|I_i = 0, X_{2i}) &= X_{2i}\beta_2 - \sigma_2\rho_{2v}\lambda_2 \end{aligned}$$

where,

$$\lambda_1 = \frac{\phi(W_i\frac{\alpha}{\sigma_v})}{\Phi(W_i\frac{\alpha}{\sigma_v})}$$
$$\lambda_2 = \frac{\phi(W_i\frac{\alpha}{\sigma_v})}{1 - \Phi(W_i\frac{\alpha}{\sigma_v})}$$

and represent the Inverse Mills' Ratios. The functions ϕ and Φ represent normal distribution and the cumulative normal distributions, respectively, associated with probit models.

This model structure offers an opportunity to examine two phenomena. First, it is possible to compute treatment effects using the means. In particular, it is possible to compute the average treatment effect among the treated (TOT). In the following equation,

$$E(Y_{1i}|I_i = 1, X_{1i}) - E(Y_{2i}|I_i = 1, X_{1i}) \tag{9.1}$$

the mean of the left hand side variable is equal to the average difference between a sample contract farmer's average profitability under the contract and without the contract. A similar figure for the non-contract farmers gives the average treatment effect for those not treated. If non-contract farmers were able to contract, the average profitability premia is given by

$$E(Y_{1i}|I_i = 0, X_{2i}) - E(Y_{2i}|I_i = 0, X_{2i}) \tag{9.2}$$

Second, it is possible to investigate the pattern of sorting. Supposing the signs of the estimated correlation alternate across the coefficients, it implies that farmers are in regimes that offer them comparative advantage, so that, say, if $\rho_{1v} < 0$ and $\rho_{2v} > 0$, farmers with above average net income in regime 1 (contracting) are associated with a higher likelihood of being in regime 1 (contracting) and those earning a higher net profit not contracting are less likely to participate in contracting. Alternatively, if both coefficients are negative, i.e., $\rho_{1v} < 0$ and $\rho_{2v} < 0$, there is what Fuglie and Bosch (1995) refers to as hierarchical sorting, so that those in regime 1 have better than average net profits in both regimes, but are better off in regime 1. Those in regime 2 face below average profits in both regimes, but are better off in regime 1. If, on the other hand, $\rho_{1v} > 0$ and $\rho_{2v} < 0$ it represents a situation where, regime 1 farmers would actually have below average profitability with their status quo but would have above average gains in regime 2 and those in regime 2 have above average performance in regime 1 but below average performance in regime 2. The last possibility, when $\rho_{1v} > 0$ and $\rho_{2v} > 0$, implies that farmers in regime 1 have higher than average profitability whether they contract or not, whether they are in regime 1 or 2, and hence have absolute advantage.

From the perspective of implementing this approach, the endogenous switching model comes with a few caveats. First, it assumes joint normality of errors. Normality is often a stringent requirement and does not necessarily hold.[13] Further, the identification of the model comes through variables in the participation equation that influence participation but not the welfare outcome. The challenge is therefore to find a set of such variables. The next section discusses the nature of comparisons for each of the commodities and describes the variables used in the estimation of the model in detail.

[13]Min (2007), for instance use a nonparametric test to show that in the specific context of his empirical work, the assumption of normality is untenable. Choi and Min (2009) then propose a method for a more general class of distributions (Johnson's s-normal) and explore Korean housing demand.

9.3 The Nature of Comparisons and Variables Used

The welfare metric I use is net profit per acre per month for the field crops and net profit per month per 5000 birds for broiler.[14] The treatment effect is computed as the change in this variable associated with a change in contracting status, conditional on covariates.

For each scheme, the treatment group constitutes all contract farmers for that particular commodity, implying that they contract with either the subject firm or for any other firm. The Farmer Survey sampled non-contract farmers specifically for each of the five contracting schemes studied, as described in the Appendix A. I am able to pool all the commodity or scheme-specific non-contract farmers across the schemes to form a larger control group, given that the welfare metric and the explanatory variables collected were common across schemes. In other words, the relevant comparison group for gherkins, for instance, is not only the control group sampled specifically within the gherkins contracting scheme (or commodity /scheme-specific controls) but includes the non-contracting farmers sampled in the marigold, papaya and broiler as well (pooled controls). This is possible because there are no overlapping identities, i.e., there is no case where a farmer who is not a contract farmer with respect to one commodity is a contract farmer for another commodity. The control group for the treatment for each commodity is therefore the pooled sample of farmers who do not contract with either the subject firm(s) or any other firm. Non-contract growers of poultry are however excluded from the control group, since these include broiler producers, would alter the composition of the control groups substantially.

Figures 9.1, 9.2, 9.3 and 9.4 map the distributions of monthly net profits for contract farmers for each contracting scheme sampled in Phase 2.[15] The figures also graph the distributions of monthly net profits for two comparison or control groups : (1) a scheme or commodity-specific control group and (2) the pooled control group that pools control groups from all the contracting schemes studied, including the scheme-specific control group. This latter group represents all farmers not contracting at all from across schemes. For example, Figures 9.1 portrays the distribution of net profits for gherkins contract farmers (first, for the subject firm alone, and the second, for any firm),

[14]This is for a 5000 square feet shed space, that is considered a standard scale for broiler farmers in the region, by broiler contracting firms.

[15]The treatment effect is computed only for the sample from Phase 2.

the net profits for the gherkins-control and also the distribution of net profits for pooled control that includes the gherkin, marigold, papaya and broiler control group. From the broiler control group, only those farmers are included, who do not grow poultry and grow a field crop. For each of these commodities, it is apparent that these unconditional distributions of net profits per month are different for contract farmers (the treatment group) and non-contract farmers (the control group). This is valid for both the commodity specific control group as well as the pooled group.

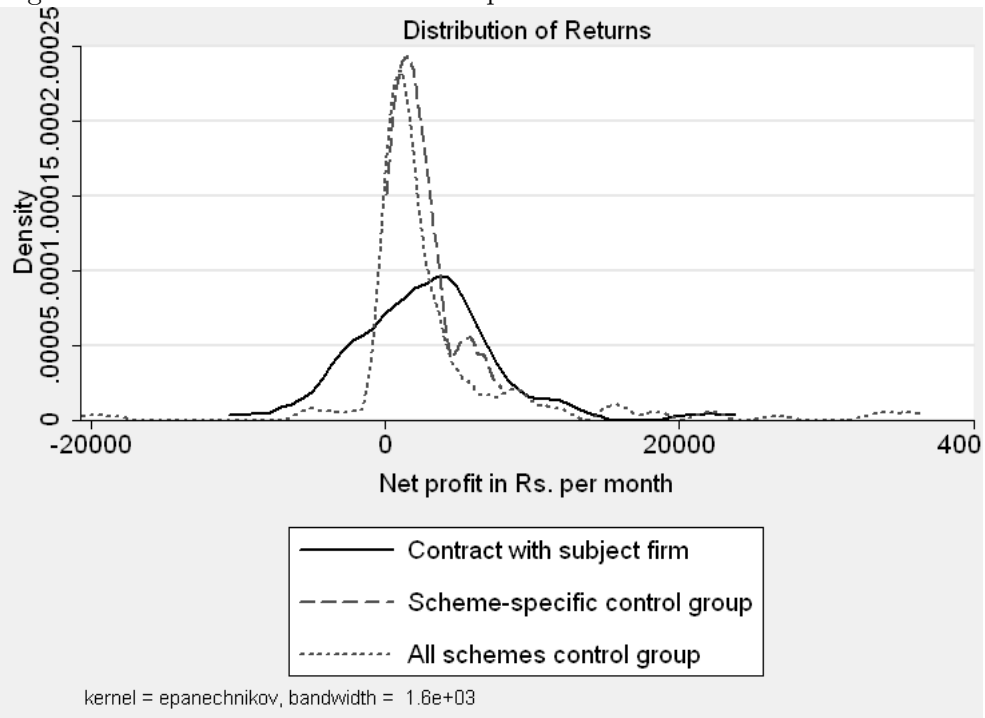
In the case of papaya and broiler, the net profit distribution for contract farmers is starkly different from that for the non-contract farmers. Comparisons for broiler deserve special attention. The broiler control group includes farmers who do not grow poultry. Since growing a field crop and growing poultry are quite different, the control group turns out to be heterogeneous, although the monthly net profits for those who do not grow poultry has been scaled down to an area area of 5000 square feet.[16] As a result of this, when the control groups from other commodities are pooled, there is a marked difference in distributions. Despite the fact that including non poultry growers in the control group implies comparisons across very different categories, in the context of a regime switching model, this yields special insight. Broiler farmers often require heavy investment in fixed assets (sheds to house the birds, feeders, drinkers, etc.) that work as barriers to entry. Most farmers convert farmland to broiler sheds. Those who are unable to do this are invariably resigned to continuing cultivation of field crops. In this context, the particular nature of comparison makes sense.

Table 9.3 presents the Kolomogorov-Smirnov tests for comparing distributions. Consistently, the distributions of returns for contract farmers (whether they contract exclusively for the subject firm or for any firm) is statistically significantly different from those of the control groups, irrespective of whether the comparison is restricted to a commodity specific control group of non-contract farmers or to the entire pool of non-contract farmers.

For a pooled control group to be a valid basis for comparing welfare gains, there needs to be an instrument or a set of instruments that is/are correlated with non-participation for both the

[16]The underlying assumption is that farmers who do not grow poultry would use the farmland to grow other field crops.

Figure 9.1: Distribution of Net Profit per month for Gherkins Contract and Non-contract farmers



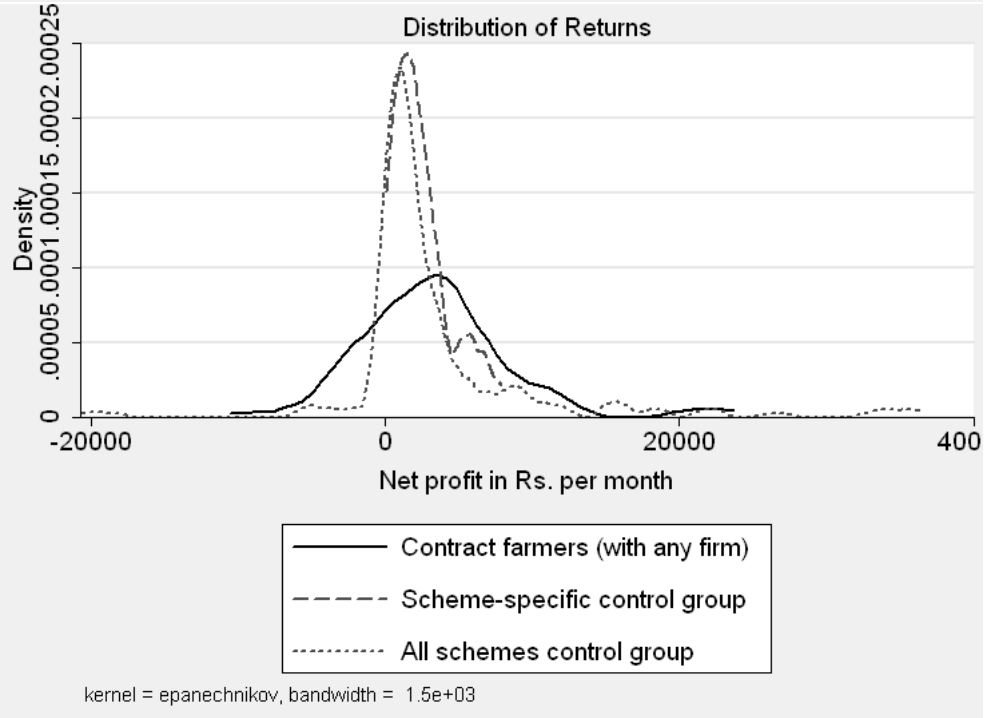


Figure 9.2: Distribution of Net Profit per month for Marigold Contract and Non-contract farmers

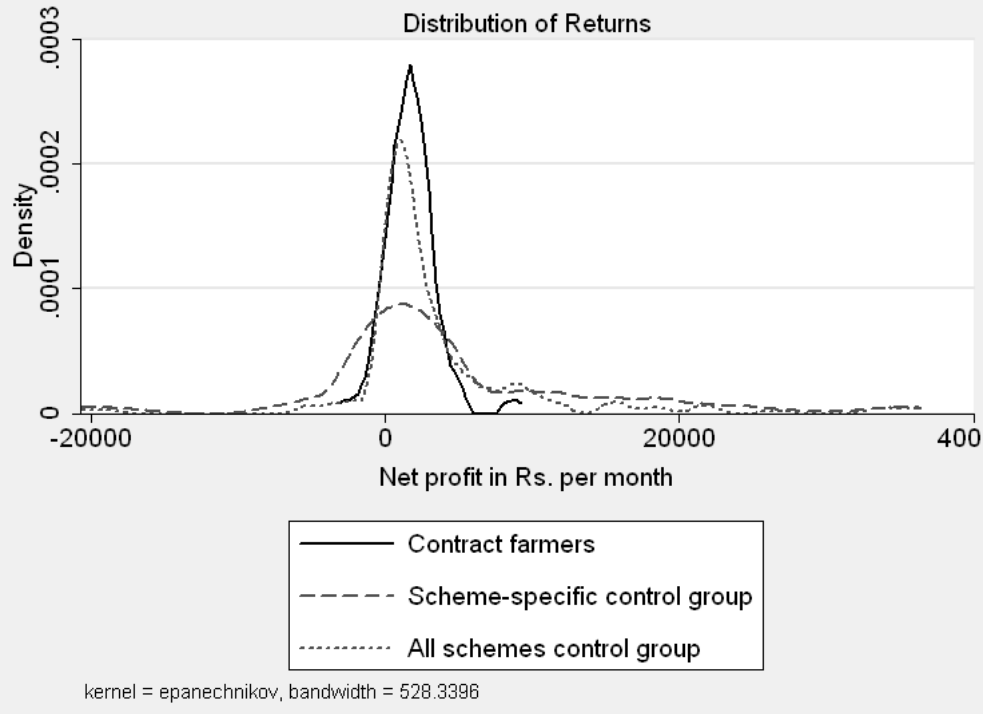


Figure 9.3: Distribution of Net Profit per month for Papaya Contract and Non-contract farmers

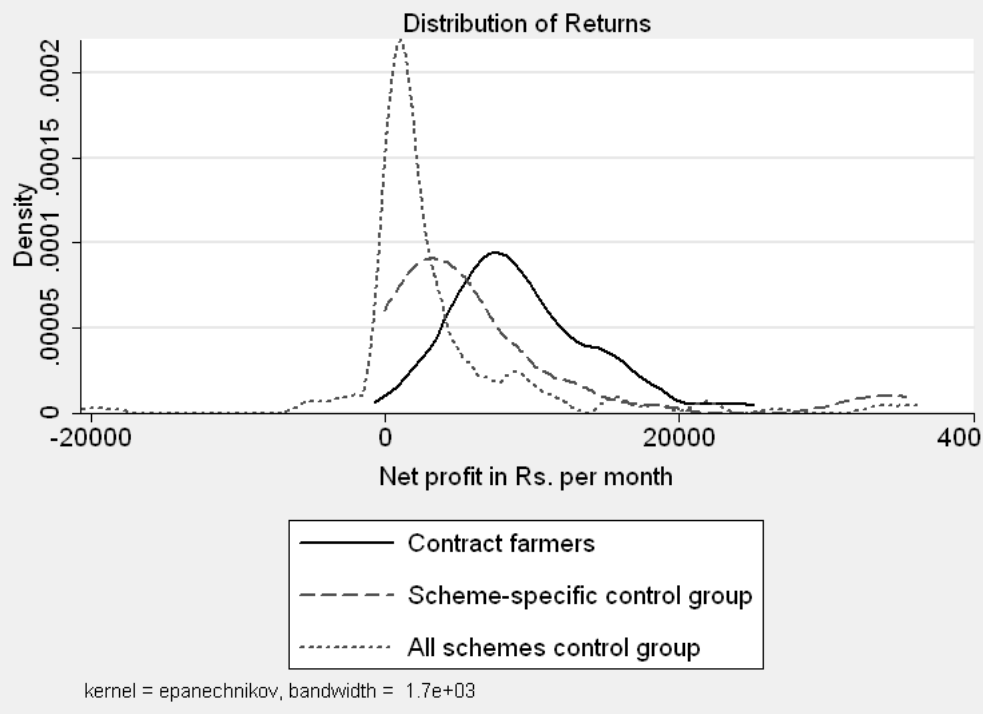
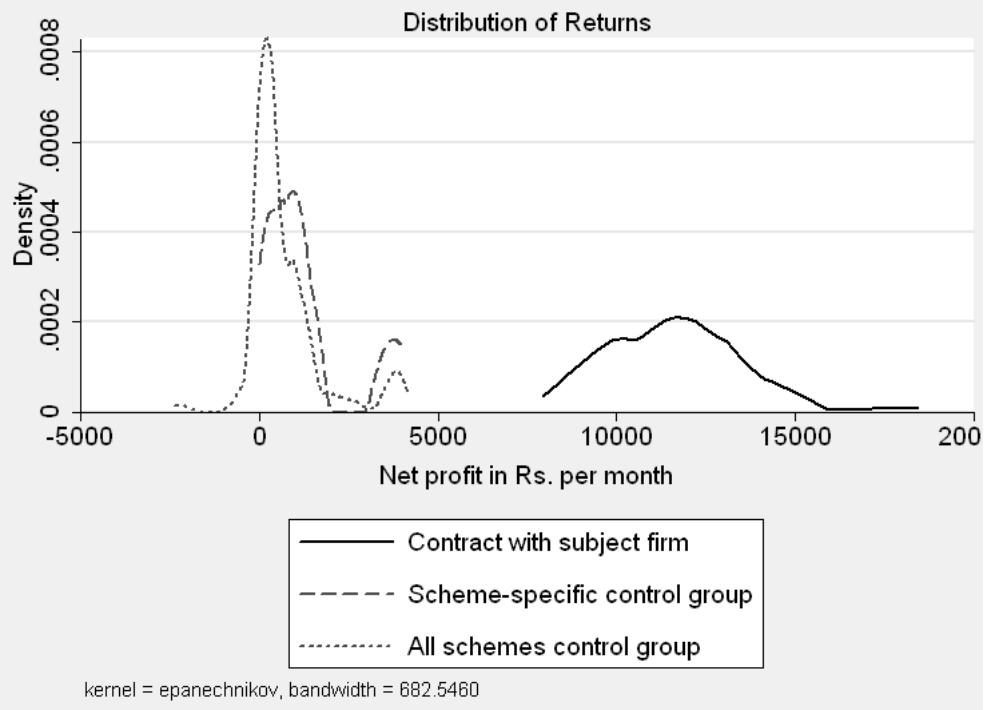


Figure 9.4: Distribution of Net Profit per month for Broiler Contract and Non-contract farmers



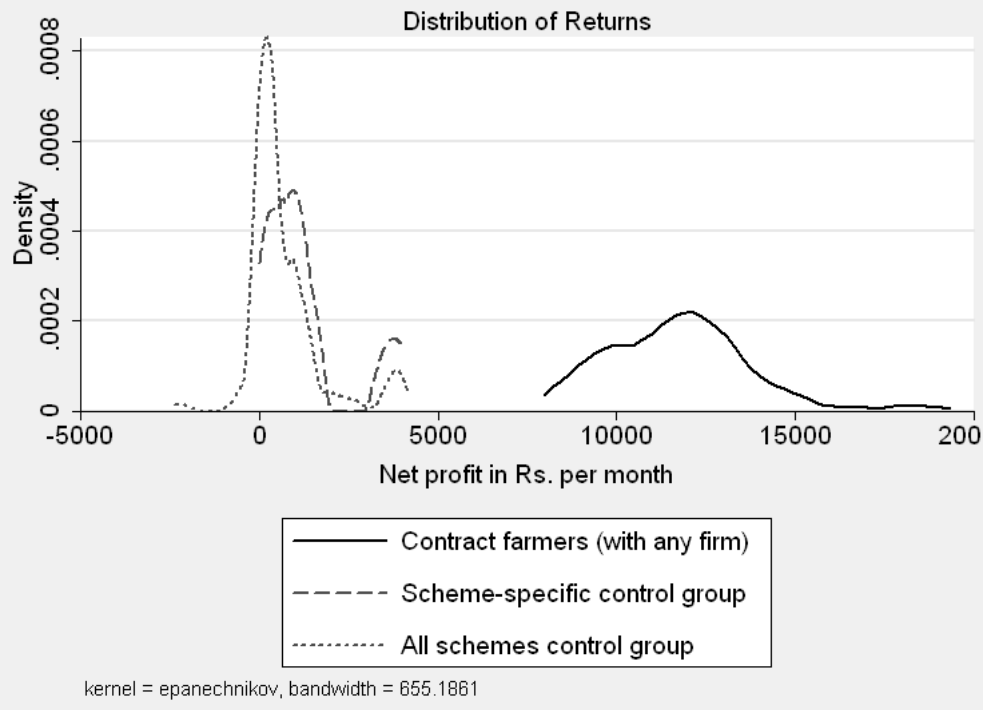


Table 9.3: Two-sample Kolmogorov-Smirnov test for equality of net profit distribution functions

Commodity	**D**	**p-value**
Gherkins		
Subject contracting firm		
Contract with subject gherkin firm versus commodity-specific control farmers	0.315	0.02***
Contract with subject gherkin firm versus all control farmers	0.266	0.01***
Any contracting firm		
Contract with any gherkins firm versus commodity-specific control farmers	0.275	0.04**
Contract with any gherkins firm versus all control farmers	0.222	0.01***
Marigold		
Contract with subject marigold firm versus commodity-specific control farmers	0.273	0.01***
Contract with subject marigold firm versus all control farmers	0.209	0.03 ***
Papaya		
Contract with subject papaya firm versus commodity-specific control farmers	0.491	0 ***
Contract with subject papaya firm versus all control farmers	0.662	0***
Broiler		
Subject contracting firm		
Contract with subject broiler firm versus other commodity-specific control farmers	1.000	0.00***
Contract with subject broiler firm versus all control farmers	1.000	0.00 ***
Any contracting firm		
Contract with any broiler firm versus commodity-specific control farmers	1.000	0.00***
Contract with any broiler firm versus all control farmers	1.000	0.00***

Significance levels : $*$: 10% $**$: 5% $***$: 1%

[1] Farmer Survey, Phase 2.
[2] The distribution for which the tests are conducted refer to net profit per acre in Rs./month for gherkins, papaya and marigold.
[3] The distribution for which the tests are conducted refer to net profit in Rs./month for 5000 birds or 5000 square feet of space.

commodity-specific control group as well as for the pooled control group, but not with the welfare metric of interest.

The instrument I use is a variable that is constructed by an interaction of an individual farmer's coefficient of absolute risk aversion elicited though experiments recording the bid price of a risky, fair bet[17] with the coefficient of variation of the spot or alternate market price of the contract commodity for which the model is estimated.[18] The higher the farmer's risk aversion or the coefficient of variation of spot market price for a commodity, the greater would be the propensity of the farmer to opt to contract. There is no strong argument to suggest that the coefficient of variation in the price of a commodity influences net profit per acre. While it is possible that absolute risk aversion coefficients might indicate a farmer's preference for risk that might impact farming practice and hence net profits, the fact that it is interacted with price variability that is set in the regional markets breaks this relationship. Further, it is an absolute number that allows for pooling farmers who might grow different crops. I also control for the possibility that farmers are not afforded the opportunity to contract with the contracting firm by using the number of contract hamlets in the block where the respondent is located. If, as Chapter 8 suggests, firms select spatially, this would control for the sample contracting firm's locational preference for sourcing supplies. Region fixed effects were ineffective since often the choice of contract regions coincides with schemes, or social group. Hence the number of hamlets was chosen over region dummy variables. In fact, this scores over the use of region dummy variable, since it captures the variation in the intensity of a firm's presence within a particular region. This cannot serve as an instrument since firms would choose regions that are more suitable for growing the contract commodity and hence does influence the welfare metric, but it is important to control for spatial selection in order to admit the validity of the pooled control group as a basis for comparison.

In addition, I use a set of instruments for the commodity specific control group that reflect

[17]This was obtained from maximum price farmers would be willing to pay for a lottery that would fetch them, with equal probability, an amount equivalent to two days of wages for a male unskilled agricultural laborer (rs.300)or one day's wage for an unskilled male worker (Rs.150). These are from questions 63, 65, 51, 38 in 1(A), 1(B), 1(C) and 1(D) respectively.

[18]The prices for marigold and papaya were collected from secondary data and for gherkins and broiler, the distribution of actual realized prices obtained by the non-subject firm growers in the survey season was used, as presented in Chapter 7.

farmer perceptions of contracting relative to the next best alternative (Chapter 7). In the Farmer Survey, I elicit subjective distributions of net profits per acre that farmers associate with contracting versus the next best alternative that they have nominated. Relative moments of these subjective distributions and stochastic dominance between them presumably influence whether they want to contract or not. In addition, risk scores from psychometric mapping of risks that include those that influence subjective perceptions of returns and those that are harder to express in monetary terms (for example, impact on health, the notion of self-respect, etc.) indicate the net incremental risk farmers associate with contracting with the firm in question.[19] These variables are summary measures that incorporate risk attitudes, assessments of farmers' abilities and expectations with regard to uncertainties of nature, among other things. In particular, it represents the net incremental risk a farmer associates with contracting (net, because it factors in both the risk and benefits to contracting, incremental, because the net risk from not contracting is subtracted from the score) and hence indicates a farmer's inclination towards contracting. Clearly, these perceptions of relative benefits and risks of contracting over alternatives potentially drives selection, but cannot determine net returns per acre, and can be used as instruments for identification.

There is a case to be made however of potential endogeneity, that the current outcome influences perceptions, given that the survey collects information for these after realization of net profits that season. I would argue that this endogeneity is weak at best. First, subjective distributions of profits were elicited for a twenty season time frame, and for a typical year, so that while the most recent experience is surely incorporated, it is unlikely to drive the responses overwhelmingly. Also, the measures used in the selection equation are relative measures, of contracting and not contracting, so that the influence of the most recent experience is further muted.

Figure 9.5 plots the range of subjective net profits per acre per month elicited in the survey alongside the actual net returns, for contract and non-contract farmers. Whenever the range bar straddles the line of equality, the actual or realized net profit that season falls within the range of subjective expectations. It is evident that in a number of cases, observations lie outside the 'typical' range expected by farmers, indicating that the most recent actual outcome has not overwhelmingly

[19]The Combined Risk Score is used here. It weights each relevant attribute by the stated frequency of occurrence as well as the criticality of the attribute to the farmer's sense of well-being. This is discussed in detail in Chapter 7.

influenced the range of typical subjective returns. Had that been the case, one would expect the actual outcomes to fall within the range for most farmers. In other words, if the season of the survey happened to be an extraordinarily good or bad year for the farmer, the figure suggests that farmers have not incorporated this in their assessments of subjective distributions of typical returns, suggesting that the instruments for identification are reliable.

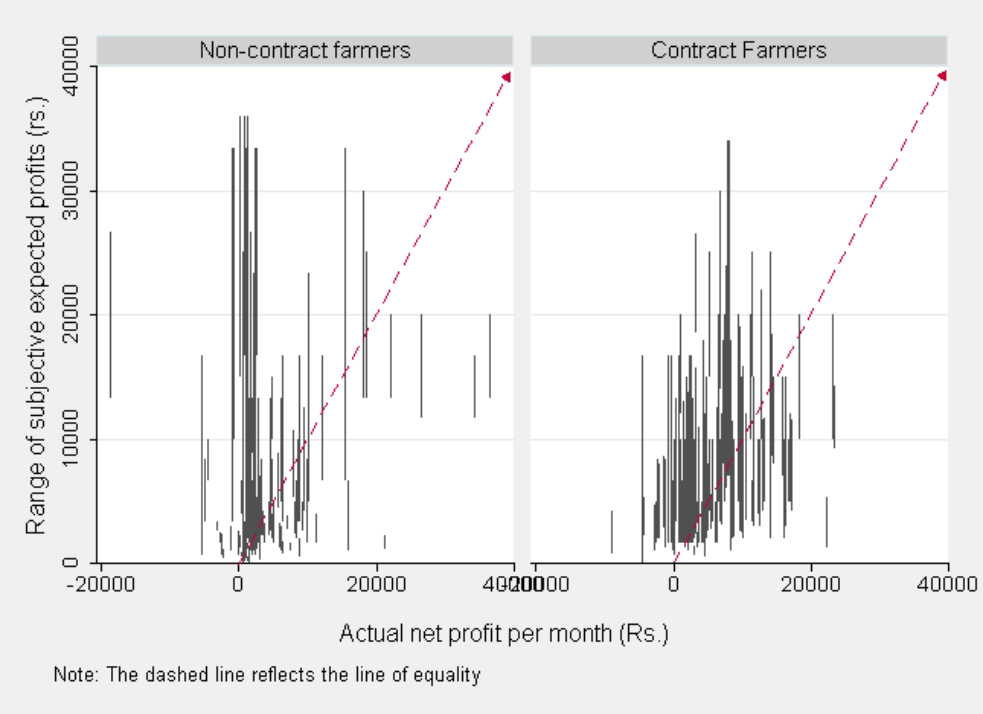
In the case of poultry, I use, additionally, fixed costs on infrastructure as a driver of selection. As mentioned, the sunk cost in often an entry barrier and hence impacts selection. Also, total investment in shed only sets the scale of operations, while there are no scale economies associated with the range of shed space farmers in the region can possibly achieve, implying that scale of investment cannot contribute to net profit per area operated. Furthermore, there is not much difference in the quality of these fixed investments that might affect net profits. It is difficult too to argue that it might be endogenous since the investment has already taken place, and is influenced by perceptions of incremental risk at the time of the investment and not influenced by current welfare outcomes. By the same logic, I use investment in irrigation facility in the selection equation for papaya, controlling for land owned that influences the ability to make such investments.[20] Together, the instruments capture essential elements for a specific non-contract farmer to serve as a control group for any of the contract commodities.

In the selection equation that sorts farmers into different regimes, apart from these instruments, I include specific farm and household characteristics, when it is of particular relevance to the contract commodity. Implicitly, these capture variables that are associated with attributes firms might be concerned about when choosing farmers and those that represent farmer willingness to contract. The attempt in this chapter is not to model the selection process, which was dealt with in Chapter 8.

For the outcome equation, I use a hybrid of a traditional production/profit function approach with those more commonly used in studies in contract farming. This is in part to judge the relative strength of association between inputs and profits across the two regimes, and to account fully for

[20]This is collected in the survey through a very question as to whether the farmer undertook any investment specifically to be enable to contract for papaya, so that this irrigation investment is not a generic investment but can be regarded as sunk cost for initiating contract farming in papaya.

Figure 9.5: Comparing expectations and outcome



the fact that in the commodities studied contract growing almost always involves higher intensity of input use, be it family labor or fertilizers and pesticides. The outcome, net profit per acre, is treated as a function of the total area under contract cultivation, application of human labor, use of fertilizers (both chemical and farm yard manure), plant protection chemicals. It is also a function of farmer and farm characteristics that might be associated with entrepreneurial abilities, experience and so on.

The estimated model varies across commodities in terms of the set of explanatory variables used. This was driven, in part, by what seemed relevant to the particular commodity. Farmer characteristics include age, social group, some indicator of education, either of the farmer or of the most educated member of the household, land owned, and distance from the nearest road. The availability of irrigation is represented by either the proportion of land irrigated or by an indicator variable for whether the farmer is dependent on rain. In the equation for outcomes, depending on the crop, input use, labor days over the season, of both hired and family labor is invariably included. Supervision enters in some cases as a binary variable. This is derived from the number of

visits over the entire cropping season or growing cycle, since the use of the latter yielded unstable coefficients. If there has been any supervision at all in the past season, the variable carries a value of one and zero otherwise. Not all the variables are used in all the equations. Tables 9.4, 9.5, 9.6 and 9.7 present the summary statistics of the variables used in the models.

The models correct for heteroscedasticity. The standard errors are clustered at the village level to account for correlation in the errors. This model is run to gauge treatment effects and not to study the correlates of selection, which have been addressed in detail in Chapter 8. Hence, the inclusion of variables, other than the instruments, to account for selection have broad relevance but are not meant to to be rigorous specifications of covariates of selection. The results of the estimation are presented for each commodity in Tables 9.8, 9.9,9.10 and 9.11. For gherkins and broiler, the relevant treatment group includes all farmers who contract, and not restricted to just the subject firm.

9.4 Estimated Treatment Effects

Table 9.12 shows the average treatment effect for both the treated (contract farmers) as well as for the untreated (non-contract farmers). The treatment effect is measured as the incremental net profit per month in rupees (Rs.). For the former, it represents the average difference between the expected net profit for contract farmers and what they would have earned had they not contracted. For the latter, it represents the average difference in expected net profit for non-contract farmers had they been contracting and the expected net profit when not contracting.[21] These are computed for the commodity-specific sample to ensure tighter comparisons and for the pooled sample to enable a broader comparison. The table also shows the standard deviation of the distribution of the estimated treatment effects to emphasize that notwithstanding the sign of the average, particular farmers might gain significantly from contracting whereas others might be significantly worse off with contracting. The variation is in part reflective of the large variations in the predicted net profits

[21] As mentioned, for gherkins and broiler, the treatment group represents contract farmers who contract with either the subject firm or any other firm.

Table 9.4: Summary Statistics for Endogenous Switching Model : Gherkins

	Non-contract farmers (n=184)				Contract farmers (n=77)			
	Mean	**Standard Deviation**	**Minimum**	**Maximum**	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**
Dependent Variable								
Net profit per acre per month (Rs.)	3453.5	6945.7	-20687	36422	3282.8	5058.3	-8982	22173
Explanatory variable								
Fertilizer application	172.8	231.6	0	2013	535.4	166.7	100	1100
Plant protection	157.3	496.9	0	3333	600.9	257.9	100	1500
Total hired labor (days)	75.2	81.8	0	374	46.4	19.6	0	100
Total family labor (days)	40.9	46.2	0	208	155.4	48.6	46	266
Land owned (acres)	6.7	11.4	0	106	2.2	4.6	0	40
Distance from surfaced road (kms.)	1.5	7.1	0	50	0.4	0.5	0	3
Age (years)	46.9	11.1	23	79	38.5	9.3	22	70
(D) Most educated family member is illiterate	36.2	N.A	0	1	5.2	N.A	0	1
Combined risk score for commodity-specific control farmers	14.3	61.8	-200	338	-33.8	167.9	-400	350
Risk aversion to open market prices	1.1	0.3	1	2	1.3	0.1	1	1
(D)Contracting first order stochastic dominates next best alternative	27.6	N.A	0	1	56	N.A	0	1
(D)Contracting second order stochastic dominates next best alternative	29.7	N.A	0	1	59	N.A	0	1
Ratio of mean returns from contracting over next best alternative	0.7	2.440677	0	27	3.2	4.5	0	25
The number of hamlets sample firm procures from in the block	2.1	4.2	0	11	8.1	3.9	2	11

[1] Farmer Survey, Phase 2,2009-10.
[2] Contract farmers refer to only those who contract with either the subject firm or any other firm. Non contract farmers refers to those who do not contract at all and are the pooled controls

Table 9.5: Summary Statistics for Endogenous Switching Model : Marigold

	Non-contract farmers (n=208)				Contract farmers (n=59)			
	Mean	**Standard Deviation**	**Minimum**	**Maximum**	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**
Dependent Variable								
Net profit per acre per month (Rs.)	3565.1	6783.6	-20687	36422	1705.1	1701.7	-2600	8750
Explanatory variable								
Fertilizer application	217	260	0	2013	201.2	50.71	125	350
Plant protection	212	503	0	3333	0.0	0	0	0
Total hired labor (days)	73	78	0	374	142.7	63.06	68	417
Total family labor (days)	55	62	0	266	14.5	4.52	8	35
Number of visits by field official	2	2	0	6	2.4	1.17	1	6
Land owned (acres)	6	11	0	106	5.2	3.84	1	25
(D) Rainfed farm	0		0	1	0	N.A.	0	0
Percentage of land owned that is irrigated	76	30	0	100	90.2	23.17	0	100
Distance from surfaced road (kms.)	1	7	0	50	1.6	1.76	0.1	10
Age (years)	46	11	23	79	45.3	12.33	25	80
(D) Education	16	N.A.	0	1	53	N.A.	0	1
Combined risk score for commodity-specific control farmers	-117	193	-668	0	-601.7	169.10	-1297	0
Risk aversion to open market prices	9	2	4	13	6.4	1.29	2	13
Difference in Skewness in returns from contracting and next best alternative'	0	0.6	-2.7	3	0.3	1.02	-2	3
(D)Contracting first order stochastic dominates next best alternative	8	N.A.	0.0	1	25	N.A.	0	1
(D)Contracting second order stochastic dominates next best alternative	7	N.A.	0.0	1	14	N.A.	0	1
Ratio of mean returns from contracting over next best alternative	0.35	0.9	0.0	7	0.8	0.74	0	3
The number of hamlets sample firm procures from in the block	1	1.6	0.0	5	4	0.95	3	5

[1] Farmer Survey, Phase 2,2009-10.

[2] Contract farmers refer to only those who contract with the subject firm, since there are no other firms contracting in the region. Non contract farmers refers to those who do not contract at all and are the pooled controls

Table 9.6: Summary Statistics for Endogenous Switching Model : Papaya

	Non-contract farmers (n=196)				Contract farmers (n=72)			
	Mean	**Standard Deviation**	**Minimum**	**Maximum**	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**
Dependent Variable								
Net profit per acre per month (Rs.)	3565.1	6783.6	-20687	36422	9289.0	4724.8	973	23382
Explanatory variable								
Plant protection	212.3	502.9	0	3333	962.2	1072.8	0	4333
Total hired labor (days)	72.7	77.7	0	374	63.2	82.4	5	454
Total family labor (days)	55.4	62.2	0	266	96.2	44.8	0	164
(D)Supervision	3.8	N.A	0	1	2.8	N.A	0	1
Land owned (acres)	6.2	10.8	0	106	5.7	5.0	0	25
Percentage of land owned that is irrigated	76.2	30.3	0	100	88.3	20.1	30	100
Distance from surfaced road (kms.)	1.4	6.7	0	50	0.8	1.4	0	6
Age (years)	46.3	11.1	23	79	45.1	9.5	27	70
(D) Scheduled Caste or Tribe	0.5	N.A	0	1	5.6	N.A	0	1
(D) Highest educated family member is illiterate	4.8	N.A	0	1	43.1	N.A	0	1
Combined risk score for commodity-specific control farmers	-13.9	63.2	-490	130	-96.1	186.2	-610	455
Risk aversion to open market prices	4.7	1.0	2	6	4.1	1.3	0	6
Difference in Skewness in returns from contracting and next best alternative'	0.0	0.3	-1.9	2	0	1.1	-2.96	2
Contracting first order stochastic dominates next best alternative	7	N.A	0.0	1	7	N.A	0	1
Contracting second order stochastic dominates next best alternative	7	N.A	0.0	1	36	N.A	0	1
Ratio of mean returns from contracting over next best alternative	1.8	2.7	0.1	27	1	1.0	0.16	4
The number of hamlets sample firm procures from in the block	0.8	1.3	0.0	7	3	2.6	1	7

[1] Farmer Survey, Phase 2,2009-10.

[2] Contract farmers refer to only those who contract with the subject firm, since there are no other firms contracting in the region. Non contract farmers refers to those who do not contract at all and are the pooled controls

Table 9.7: Summary Statistics for Endogenous Switching Model :Broiler

	Non-contract farmers (n=208)				Contract farmers (n=81)			
	Mean	**Standard Deviation**	**Minimum**	**Maximum**	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**
Dependent Variable								
Net profit per month (Rs.)	689.8	1032.0	-2379	4188	11729.4	1958.4	8625	18698
Explanatory variable								
Total hired labor (days)	72.7	77.7	0	374	107.5	87.4	12	430
Total family labor (days)	55.4	62.2	0	266	111.6	66.7	0	280
Land owned (acres)	6.2	10.8	0	106	6.9	6.3	0	45
Percentage of land owned that is irrigated	76.2	30.3	0	100	59.5	34.7	0	100
Distance from surfaced road (kms.)	1.4	6.7	0	50	0.3	0.7	0	5
Age (years)	46.3	11.1	23	79	46.1	11.0	29	75
Combined risk score for commodity-specific control farmers	-7.5	50.2	-300	175	-194.6	97.3	-379	85
Risk aversion to open market prices	1.5	0.3	1	2	1.5	0.4	0	2
The number of hamlets sample firm procures from in the block	2.1	3.6	0	12	6.8	4.0	0	12

[1] Farmer Survey, Phase 2,2009-10.
[2] Contract farmers refer to only those who contract with either the subject firm or any other firm. Non contract farmers refers to those who do not contract at all and are the pooled controls.
[3] The net profit per month figures pertain to net profit for a standard area denoted by the shed space that can hold 5000 birds to enable comparison across groups.

Table 9.8: Gherkins: Endogenous Switching Model

Dependent variable: Net profit per acre per month (Rs.)			
Variable	**Coefficient**	**Robust Standard Error**	**z-statistic**
Regime 1: Contracting with any firm			
Percentage of cultivated land that is irrigated			
Land owned (acres)	79.12	44.26	1.79 *
Distance from surfaced road (kms.)	1431.78	626.44	2.29 **
Total hired labor (days)	34.26	38.13	0.90
Total family labor (days)	56.59	24.58	2.30 **
Age (years)	32.88	83.74	0.39
Plant protection (liters)	-1.64	3.26	-0.50
Fertilizer application (kgs.)	-2.85	4.85	-0.59
(D) Family member has post-secondary education	-819.09	1269.06	-0.65
Constant	-7272.07	2665.34	-2.73 ***
Regime 2: Not contracting with any firm			
Land owned (acres)	-24.52	23.61	-1.04
Distance from surfaced road (kms.)	51.14	134.46	0.38
Total hired labor (days)	10.17	11.59	0.88
Total family labor (days)	8.02	16.7	0.48
Plant protection (liters)	2.04	0.89	2.29 **
Fertilizer application (kgs.)	1.78	1.85	0.96
(D) Family member finished schooling	-908.66	1217.62	-0.75
Age (years)	-41.6	44.31	-0.94
Constant	4515.43	2018.73	2.24 **
Regime selection			
Land owned (acres)	-0.02	0.02	-1.00
Distance from surfaced road (kms.)	0.03	0.04	0.75
Total hired labor (days)	0.0132105	0.0044574	2.96 ***
Total family labor (days)	0.0199565	0.0040036	4.98 ***
Age (years)	-0.04	0.02	-2.00 **
Plant protection (liters)	-0.0001685	0.0004513	-0.37
Fertilizer application (kgs.)	0.0010447	0.0004734	2.21 **
(D) Family member finished schooling	-1.24	0.54	-2.30 **
Combined risk score X Dummy for Gherkins	0.0007893	0.0010128	0.78
Risk aversion to open market prices	4.87	1.32	3.69 ***
Ratio of mean returns from contracting over next best alternative	-0.06	0.04	-1.50 *
Number of contract hamlets in block	0.12	0.03	4.00 ***
Constant	-8.52	2.26	-3.77 ***
Mills' Ratio Regime 1 (mean)	2.9		
Mill's Ratio Regime 2 (mean)	0.46		
N	261		
Wald chi2(8)	71.02		
Prob > chi2	0.00 ***		
Log pseudolikelihood	-2682.57		

Significance levels : * : 10% ** : 5% *** : 1%

[1] (D) means dummy variable taking on the value 1 when the variable is true and 0 otherwise.
[2] FOSD means contracting first order stochastic dominates next best alternative.
[3] SOSD means contracting second order stochastic dominates next best alternative.

Table 9.9: Marigold: Endogenous Switching Model

Dependent variable: Net profit per acre per month (Rs.) **Variable**	**Coefficient**	**Robust Standard Error**	**z-statistic**
Regime 1: Contracting with sample firm			
(D) Rainfed farm	160.53	381.13	0.42
Fertilizer application (kgs.)	15.16	5.07	2.99 ***
Land owned (acres)	45.97	42.43	1.08
Distance from surfaced road (kms.)	-53.33	106.89	-0.50
Total hired labor (days)	-0.44	3.25	-0.14
Total family labor (days)	122.96	52.25	2.35 **
Age (years)	19	17.95	1.06
(D) Family Education (1=Illiterate)	-32.46	350.2	-0.09
Constant	-4274.66	1741.75	-2.45 **
Regime 2: Not contracting with sample firm			
Land owned (acres)	-17.32	17.04	-1.02
(D) Rainfed	1544.48	1040.3	1.48
Fertilizer application (kgs.)	0.6	1.09	0.55
Distance from surfaced road (kms.)	71.52	139.22	0.51
Total hired labor (days)	10.63	10.28	1.03
Total family labor (days)	7.32	7.28	1.01
(D) Family illiterate	-750.48	2689.73	-0.28
Age (years)	-28.89	35.39	-0.82
Constant	2562.74	2144.39	1.20
Regime selection			
(D) Rainfed	1.38	0.77	1.79 *
Fertilizer application	-0.003	0.001	-1.93 *
Land owned (acres)	0.05	0.02	2.50 ***
Distance from surfaced road (kms.)	-0.02	0.01	-2.00 *
Total hired labor (days)	0.00	0.00	1.07
Total family labor (days)	0.03	0.01	3.00 ***
Age (years)	0.01	0.01	1.00
(D) Family illiterate	0.02	0.33	0.06
Combined risk score X Marigold Scheme dummy	-0.01	0.00	-3.31 ***
Risk aversion to open market prices	-0.1	0.16	-0.63
Difference in skewness	-0.06	0.19	-0.32
(D) FOSD	-1.13	0.66	-1.71 *
(D) SOSD	1.19	0.59	2.02 **
Ratio of mean returns	-0.15	0.16	-0.94
Number of contract hamlets in block	1.21	0.36	3.36 ***
Constant	-7.89	2.75	-2.87 ***
Mills' Ratio Regime 1 (mean)	3.83		
Mill's Ratio Regime 2 (mean)	0.31		
N	267		
Log pseudo-likelihood	-2675.51		
Wald chi2(8)	23.51		
Prob > chi2	0.003***		

Significance levels : ∗ : 10% ∗∗ : 5% ∗ ∗ ∗ : 1%

[1] (D) means dummy variable taking on the value 1 when the variable is true and 0 otherwise.
[2] FOSD means contracting first order stochastic dominates next best alternative.
[3] SOSD means contracting second order stochastic dominates next best alternative.

Table 9.10: Papaya: Endogenous Switching Model

Dependent variable: Net profit per acre per month (Rs.) **Variable**	**Coefficient**	**Robust Standard Error**	**z-statistic**
Regime 1: Contracting with sample firm			
Percentage of cultivated land that is irrigated	7.95	22.63	0.35
Land owned (acres)	-210.92	107.13	-1.97 **
Distance from surfaced road (kms.)	914.22	404.54	2.26 **
(D) Supervision	-656.35	1343.36	-0.49
Total hired labor (days)	-1.2	5.65	-0.21
Total family labor (days)	-8.5	14.9	-0.57
Age (years)	-22.78	48.92	-0.47
Plant protection (liters)	1.87	0.58	3.22 ***
(D) Family illiterate	-5441.89	2242.54	-2.43 **
(D) Scheduled Caste/Tribe	1904.13	1501.49	1.27
Number of crops grown annually per acre	455.33	952.15	0.48
Constant	9405.84	3986.8	2.36 **
Regime 2: Not contracting with sample firm			
Land owned (acres)	-16.6	13.36	-1.24
Percentage of cultivated land that is irrigated	55.28	15.77	3.51 ***
Distance from surfaced road (kms.)	47.65	110.31	0.43
Total hired labor (days)	-2.92	14.03	-0.21
Plant protection (liters)	1.43	0.83	1.72 *
Total family labor (days)	20.31	10.49	1.94 *
(D) Scheduled Caste/Tribe	-6141.49	1342.13	-4.58 ***
(D) Family member finished primary school	-1625.52	1001.63	-1.62
Age (years)	13.14	40.15	0.33
(D) District 2	5259.96	1726.09	3.05 ***
(D) District 1	1810.08	1258.55	1.44
Number of crops grown annually per acre	-313.28	287.79	-1.09
Constant	-4038.88	2458.45	-1.64
Regime selection			
Percentage of cultivated land that is irrigated	0.01	0.01	1.00 *
Distance from surfaced road (kms.)	0.01	0.03	0.33
(D) Supervision	-2.35	0.49	-4.80 ***
Total hired labor (days)	0.00	0.00	-0.32
Total family labor (days)	0.01	0.00	2.94 ***
Age (years)	0.005	0.02	0.23
Plant protection	0.0004	0.00	1.90 *
(D) Family illiterate	-0.99	0.44	-2.25 **
(D) Scheduled Caste/Tribe	0.38	0.42	0.90
Number of crops grown annually per acre	-0.94	0.31	-3.03 ***
Land owned (acres)	0.06	0.05	1.20
(D) Family member finished primary school	-0.79	0.48	-1.65 *
(D) District 2	8.68	5.27	1.65 *
(D) District 1	9.91	5.31	1.87 *
Combined risk score X Papaya dummy	-0.0009224	0.0016392	-0.56
Risk aversion to open market prices	-0.57	0.23	-2.48 **
Ratio of coefficient of variation in returns	2.52	1.82	1.38
Difference in Skewness	0.06	0.23	0.26
(D) FOSD	-0.48	0.71	-0.68
(D) SOSD	0.52	0.76	0.68
Ratio of mean returns	-0.51	0.23	-2.22 **
Sunk Cost (Rs.'0000)	0.222	0.115	1.93 *
Number of contract hamlets in block	0.18	0.13	1.38
Constant	-7.54	6.23	-1.21
Mills' Ratio Regime 1 (mean)	4.44		
Mill's Ratio Regime 2 (mean)	0.48		
Number of observations	267		
Log pseudolikelihood	-2712.45		
Wald chi2(11) =	438		
Prob >chi2 =	0.00***		

Significance levels : * : 10% ** : 5% *** : 1%

[1] (D) means dummy variable taking on the value 1 when the variable is true and 0 otherwise.

[2] FOSD means contracting first order stochastic dominates next best alternative.

[3] SOSD means contracting second order stochastic dominates next best alternative.

Table 9.11: Broiler: Endogenous Switching Model

Dependent variable: Net profit per acre per month (Rs.) **Variable**	**Coefficient**	**Robust Standard Error**	**z-statistic**
Regime 1: Contracting with any firm			
Land owned (acres)	-48.87	25.49	-1.92 *
Percentage of cultivated land that is irrigated	10.38	5.65	1.84 *
Distance from surfaced road (kms.)	153.95	129.87	1.19
Age (years)	13.15	14.86	0.88
Total hired labor (days)	4.38	2.15	2.04 **
Total family labor (days)	21.41	3.57	6.00 ***
Constant	7935.9	981.34	8.09 ***
Regime 2: Not contracting with any firm			
Age (years)	5.02	5.87	0.86
Land owned (acres)	10.57	3.5	3.02 ***
Percentage of cultivated land that is irrigated	9.7	2.04	4.75 ***
Total hired labor (days)	1.56	1.29	1.21
Total family labor (days)	0.77	0.89	0.87
Distance from surfaced road (kms.)	3.83	13.05	0.29
Constant	-507.39	299.88	-1.69 *
Regime selection			
Land owned (acres)	0.04	0.65	0.06
Percentage of cultivated land that is irrigated	-0.03	0.14	-0.21
Distance from surfaced road (kms.)	-0.75	2.58	-0.29
Age (years)	-0.01	0.25	-0.04
Total hired labor (days)	0	0.08	0.00
Total family labor (days)	0.01	0.12	0.08
Combined risk score X Broiler dummy	-0.01	0.0046	-2.17 **
Risk aversion to open market prices	0.68	3.97	0.17
Sunk cost (Rs. '0000)	0.894	9.683	0.09
Number of contract hamlets	0	11.26	0.00
Constant	-2.9	102.16	-0.03
Mills' Ratio Regime 1 (mean)	3.99		
Mill's Ratio Regime 2 (mean)	0.69		
N	289		
Log likelihood	-2431.53		
Wald chi2(6)	55.76		
Prob > chi2	0 ***		

Significance levels : * : 10% ** : 5% *** : 1%

[1] (D) means dummy variable taking on the value 1 when the variable is true and 0 otherwise.

earned in the season surveyed and partly from similar variations in the estimated counterfactuals as in Equations 9.1 and 9.2.

The findings differ across schemes. In the case of gherkins and marigold, the treatment effect on both the treated and untreated is negative, implying that contracting leaves both contract and non-contract farmers worse off in terms of net profit per acre per month. Gherkins contract farmers have earned, on average, a lower net profit per month by virtue of choosing to contract. Had they not, they would have, on average, earned, close to one and a half times their net profit from contracting. Marigold farmers could have earned a return that was fifty percent higher than their net profit from contracting had they not grown for the sample firm.

For the commodity-specific control group of non-contract farmers, the results suggest that non-participating farmers are better off that way, and contracting either for gherkins or marigold would leave them worse off. To put these results in perspective, those who did not grow gherkins often grew tomato or other horticultural crops, which fetched the farmers particularly good returns this season. As for marigold, as Chapter 11 describes in detail, the price in the fresh flower market often shoots up and is typically higher than the contract price. The negative treatment effect reflects, in all likelihood, this effect. It is important to note that this is an average across farmers and also picks data for just one season, so that it only represents a snapshot view, that is not necessarily robust.

For broiler and papaya, contracting increases net profits on average, for both contract farmers and those not currently contracting. Papaya contract farmers would have foregone 37% of their current net profits had they chosen not to contract for papaya, broiler growers would have lost one and a half times their average net earnings had they not opted to contract. For those not participating, entering papaya contracting would enhance a non-participating farmer's net profit by 47% and if non-contract farmers were to take up contracting with the sample firm for broiler, they would earn net profits that are more 123% higher.

In the gherkins contracting scheme, ρ_{1v} is positive and statistically significant. This indicates that farmers who contract for gherkins have a absolute advantage in participating. They tend to have a higher than average net profit whether or not they are contracting. In the broiler

contracting scheme, there is clear evidence of hierarchical sorting. Both ρ_{1v} and ρ_{2v} are negative and statistically significant. This indicates that those who contract have better than average profits, irrespective of whether they contract or not, but are better off when contracting. Those who do not contract face below average profits in both regimes, and would be better off contracting. This is indicative of exclusion of 'low ability' farmers. Papaya is similar to broiler in that both ρ_{1v} and ρ_{2v} are negative but neither is statistically significant indicating that selection is potentially exogenous. The coefficient of correlation is not statistically significant for marigold and hence, here too selection is possibly exogenous. This is broadly consistent with the current operational status of the schemes, as evident from interviews with agribusinesses. For example, for the marigold scheme, the contracting arrangements are not tight in the sense that sidesale to the spot market is very high (discussed in detail in the next chapter). This muddies any evidence of sorting. Again for papaya, this year saw a catastrophic loss of the papaya crop to mealybug infestation, again rendering inferences regarding sorting murky.[22]

When treatment effects on the untreated are computed for all controls, participation in contract farming in each of the commodities studied is associated with positive net gains on an average (Table 9.12). Should these farmers be able to contract for gherkins, they could increase their incomes by about 28% in gherkins and for marigold, by 79% and substantially more for papaya (114%) and broiler (206%).

Treatment effects that measure an average impact on the set of farmers can potentially mask the heterogeneity of farmer experiences. To unravel these farmer level differences, it is useful to graph the distribution of treatment effects. Figures 9.6, 9.7, 9.8 and 9.9 show the range of treatment effects for different farmers, mapping the two distributions for contract and non-contract farmers separately. These distributions are key to understanding the origins of the dynamics of contract farming arrangements. In most cases, the distributions of treatment effects for both contract and non-contract farmers straddle the positive and negative axis. This suggests that some contract

[22]The coexistence of the beneficial treatment effect and the catastrophic loss is partly on account of the timing of the survey. The actual net profits recorded for papaya were for the preceding year, which was then converted to net profit per acre per year. At the time of the survey, the mealybug epidemic had been affecting crops for about three months. Since papaya latex extraction is a continuous process, the welfare metric captures a mixture of high yields and low yields. Without the mealybug attack, papaya contract farmers are likely to have benefited much more from papaya contracting, and there might have been stronger evidence on sorting.

Table 9.12: Treatment Effects and Regime Sorting

Variable	**Mean incremental income (Rs.)**	**Standard Deviation of distribution of point estimates**	**Average Treatment effect as a proportion of average actual net profit**	**Number of observations**
Treatment Effect on the Treated				
Gherkin	-4407	1989	-1.46	77
Marigold	-1577	1334	-0.49	59
Papaya	3175	3594	0.37	71
Broiler	11082	1236	1.51	81
Treatment Effect on the Untreated(Commodity-specific controls)				
Gherkin	-174	3009	-1.02	38
Marigold	-4167	2557	-1.29	62
Papaya	4030	2112	0.47	27
Broiler	9040	1331	1.23	57
Treatment Effect on the Untreated(All controls)				
Gherkin	1172	4162	0.28	180
Marigold	3377	9699	0.79	208
Papaya	4844	492	1.14	196
Broiler	10066	1682	2.66	208
Correlation Coefficients in the Switching Models	**Regime 1 :** ρ_{1v}		**Regime 2 :** ρ_{2v}	
	Estimate	Standard Error	Estimate	Standard Error
Gherkins	0.51	0.20 **	0.45	0.46
Marigold	0.22	0.21	-0.14	0.11
Papaya	-0.17	0.58	-0.05	0.37
Broiler	-0.97	0.54 **	-0.99	0.60**

Significance levels : $*$: 10% $**$: 5% $***$: 1%

[1] For gherkins and marigold all costs are for the most recent season completed, for one acre, which spans three months.
[2] For papaya, this is an annual figure that has been converted to an equivalent per month per acre.
[3] For broiler, this is a monthly figure per 5000 birds or 5000 square feet of shed space.
[4] All treatment effects are computed and averaged over the sample within commodities.
[5] For gherkins

farmer might be better off opting out of the regime, while there are some non-contract farmers who might have an incentive to participate in contracting arrangements. This opens up the possibility of farmers reassessing their decisions to contract or taking specific actions to enter into transactional arrangements with firms.

There are only two cases in this sample where the treatment effect is unambiguously positive across treatment and different control groups. For papaya and broiler, non-contract farmers appear certain to benefit from contracting I suggest that for marigold and gherkins, the results require careful interpretation. Apart from the fact that this is evidence for one season and aggregates substantial heterogeneity across farmers, it might reflect the prices in the markets for the other crops that control group farmers grew, tomato, for instance. The treatment effect in this case can easily switch signs depending on market conditions. The key finding is however the heterogeneity of farmer experience. The large standard deviations in the point estimates of the average treatment effect reflect both the variation in the net profits accruing to the farmers in the survey season but also the range of potential impact of contracting for the various farmers.

Figure 9.6: Treatment Effect for Gherkins Contract and Non-contract farmers

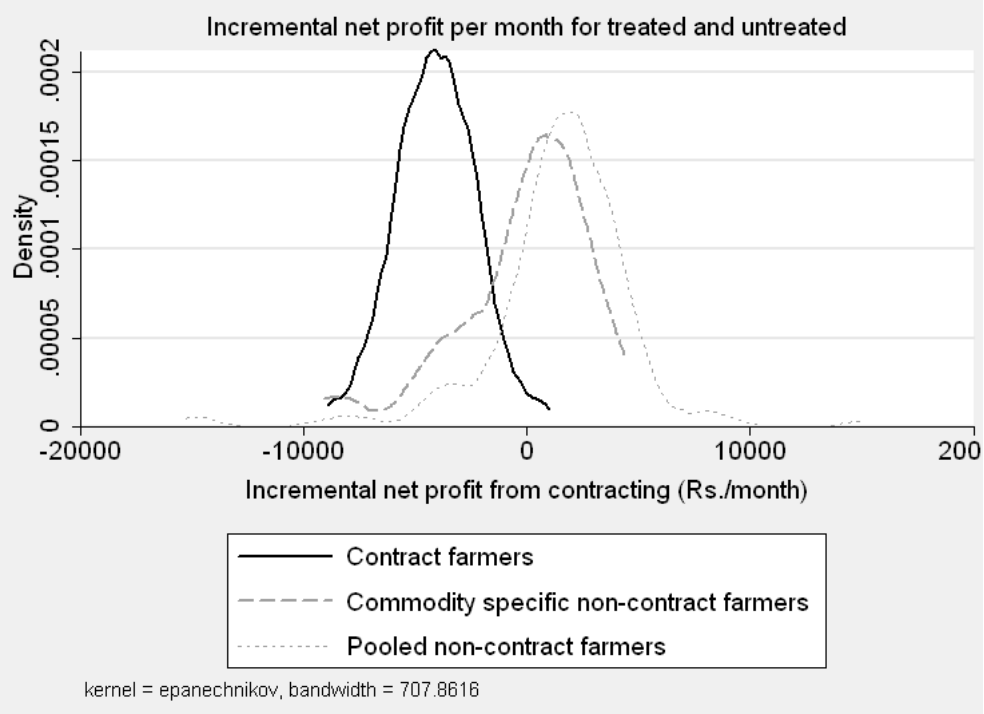


Figure 9.7: Treatment Effect for Marigold Contract and Non-contract farmers

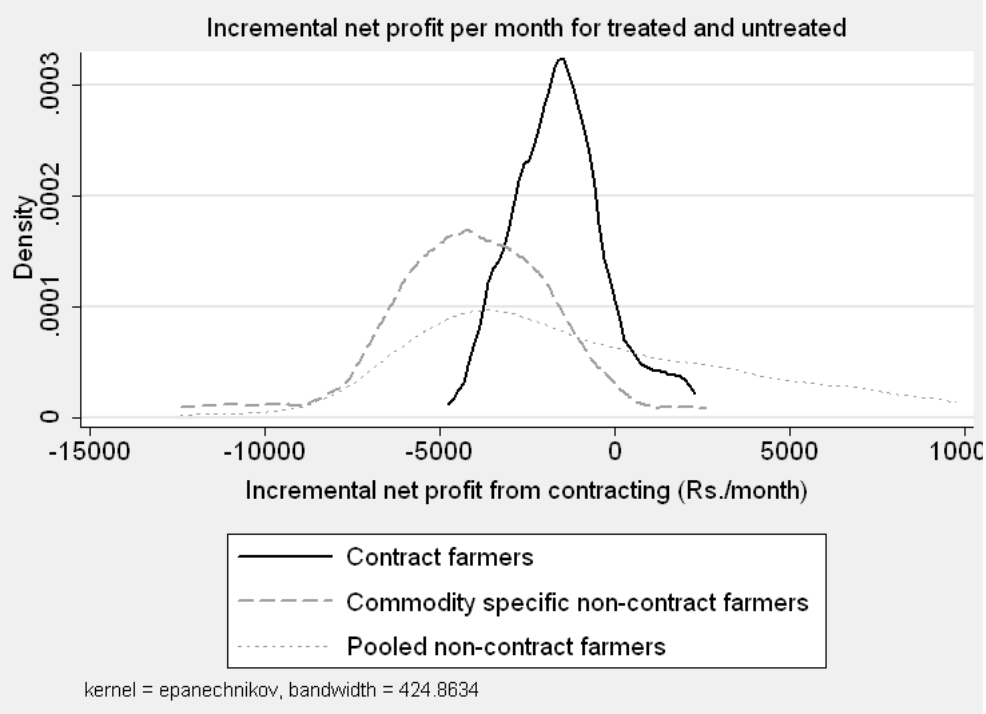


Figure 9.8: Treatment Effect for Papaya Contract and Non-contract farmers

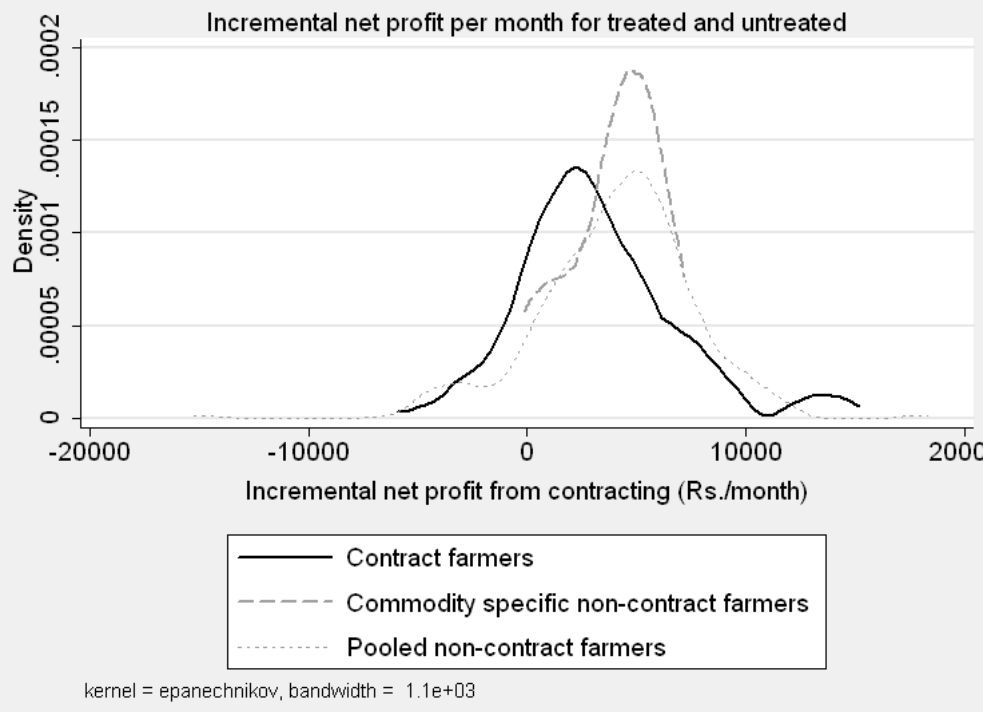
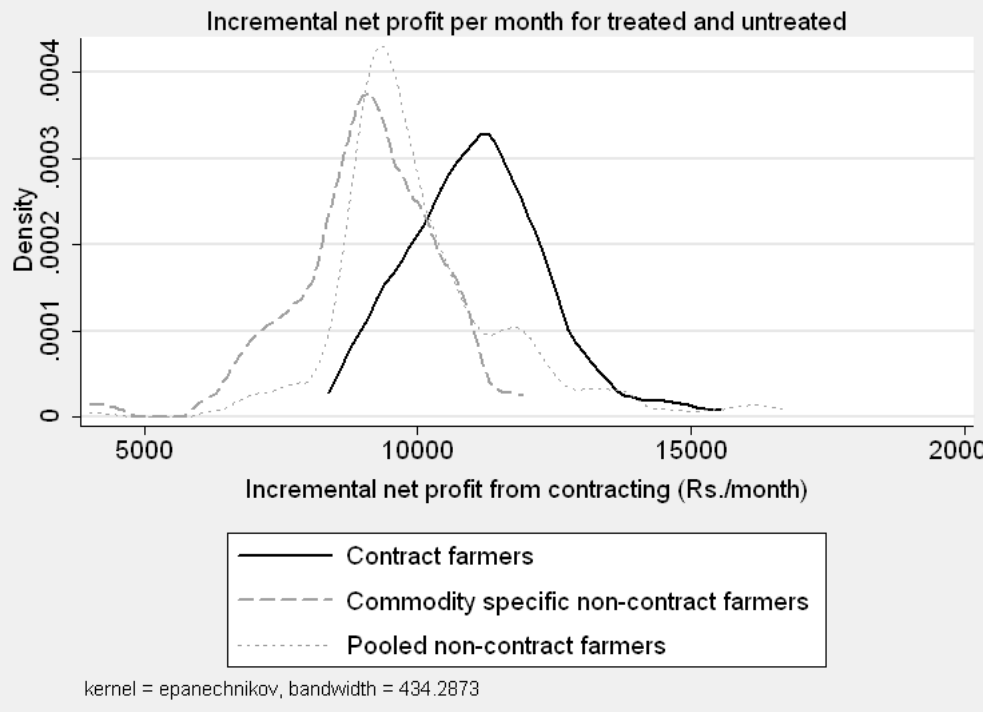


Figure 9.9: Treatment Effect for Broiler Contract and Non-contract farmers



9.5 Sources of Welfare Gains: The Structure of Costs and Returns

The heterogeneity of levels in treatment effects goes hand in hand with the sources of these gains (or losses) from contracting. This section first undertakes a simple decomposition of costs and returns to identify whether incremental incomes for contract farmers come from higher prices for the produce (being high-value crops as compared to the substitute) or via savings in transactions costs. It then assesses the returns to key factors of production across regimes that come from the estimation of the endogenous switching models.

Tables 9.13 and 9.14 indicate that other than for marigold, contract farmers, irrespective of whether they contract with the sample firm or any other firm, earn higher net returns on average. This is despite higher costs associated with contract growing.

This conforms with several previous studies that examine returns and cost structures in India. Singh (2007) and Gulati et al. (2008) review these in some detail. In general, findings suggest that the contract growing is associated with much higher costs of cultivation, 17-24 % in potato contract farming in Haryana (Tripathi and Singh, 2005) and for tomato in the Punjab (Kumar, 2007; Dileep

et al., 2002), but also higher gross and net returns driven in part by higher yields and in savings in transactions costs. Examples are gherkins (hybrid cucumber) in Andhra Pradesh (Haque, 2000; Dev and Rao, 2005), tomato in Punjab (Haque, 2000; Rangi and Sidhu, 2000) and Haryana (Dileep et al., 2002). Contract farming, when it involved a switch from traditional crops, gave much higher (almost three times) gross returns compared with that from the traditional crops of wheat, paddy in a study of tomato (Rangi and Sidhu, 2000). Studies show too that transactions costs were over 20% lower for contract milk and vegetable producers (Birthal et al., 2005). In several cases, contract farmers emerged with larger net returns per unit area of contract crop relative to those who were not contracting or grew traditional crops.

As shown in Table 9.14, broiler contracting requires large fixed investments in sheds to house birds, drinkers and feeders and so on. The chicks and feed are provided by the firm. In the schemes studied, typically, the farmers procures medicines and takes care of the maintenance expenses. Typically, women are far less involved in broiler production than men.

The other commodities do not require much fixed investment, although for gherkins and papaya, most invested in either irrigation facilities or in spraying machines. Input costs of gherkins tends to be high, owing to heavy use of fertilizer, pesticides and micronutrients. This is not the case for marigold and papaya where contract farmers make do with farm yard manure and minimal fertilizers.

An interesting contrast is the use of labor (Table 9.13). Gherkins farmers rely heavily on family labor, and it is clear that relative to farmers who do not contract, they use far greater labor per three months, owing to the demands of harvesting in time and in the application of inputs, trellising and so on. In the case of marigold, there is much greater reliance on hired labor. Here too contracting implies a greater need for labor, mainly for harvesting. Papaya and broiler require very little labor in general. As is to be expected the costs associated with transactions, marketing, transport, commissions is typically zero for contracting farmers, while non-contracting farmers do incur these expenses.[23]

[23]In general, individual circumstances of a farmer and demands made by particular commodities drive selection. Among those who grow poultry, it is also apparent that the higher the incremental risk associated with contracting, as indicated by higher combined risk scores, the lower the propensity to contract. For gherkins, younger farmers are

Table 9.13: Cost of Cultivation for Broiler growers (in Rupees)

	Subject Contract Farmers	Other Contract Farmers	Attrition Farmers
Returns			
Net profit per month per 5000 birds	11602	12747	11487
Net Return (per cycle of six weeks)	23205	25494	22974
Gross Return (per cycle of six weeks)	34839	35565	33804
Recurring Costs (per cycle of six weeks			
Total costs	11635	10071	10830
Total labor cost	3189	1736	2386
(as % of total cost)	27	17	22
Total other costs	8446	8336	8444
(as % of total cost)	73	83	78
Fixed Costs			
Fixed Costs	82700	85692	85130
Labor per cycle of six weeks			
Male hired labor(days)	14	8	10
Male family labor(days)	16	20	14
Female hired labor (days)	6	1	3
Female family labor (days)	2	5	3

[1] All costs and returns are in Rupees.
[2] Feed and chick costs are excluded from estimate of costs since the costs are borne by the contracting firm. The return is computed using grower charges, net of the costs of feed and chick for all farmer categories.
[3] The never contract farmers here grow other crops and are not presented in this table.

Table 9.14: Cost of Cultivation: Comparisons across Schemes and Farmer Groups (in Rupees)

	Gherkin (per season)				Marigold (per season)				Papaya (per month)	
Farmer type	Subject Contract Farmers	Other Contract Farmers	Attrition Farmers	Never Contract farmers	Subject Contract Farmers	Other Marigold Farmers	Attrition farmers	Never Contract farmers	Subject Contract farmers	Never Contract Farmers
Returns										
Net profit per acre per month	2780	4463	2623	2308	1705	5168	5384	3243	9289	6934
Net profit per acre	8340	13388	7870	6924	5115	15504	16153	9729	9289	6934
Gross Return per acre)	28919	34706	15296	12981	25495	44514	35190	31497	13215	10602
Recurring Costs										
Total Cost	20578	21317	7427	6057	20380	29010	18213	21768	3926	3668
Input Costs	10597	10704	3872	2584	8932	12462	5861	9270	1028	1596
(as % of total cost)	51	50	52	43	44	43	32	43	26	43
Operations Cost	9284	9781	2274	2193	1320	1822	5010	3486	147	265
(as % of total cost)	45	46	31	36	6	6	28	16	4	7
Marketing Costs	0	0	1228	1138	0	0	0	0	33	624
Total Labor Cost	696	833	53	142	10127	14726	7341	9011	2718	1134
(as % of total cost)	3	4	1	2	50	51	40	41	69	31
Fixed Costs										
Fixed cost	10491	6083	0	0	719	0	0	0	6708	0
Labor										
Female family labor (days)	64	76	38	43	4	7	0	0	8	4
Female hired labor (days)	1	1	2	2	72	73	51	47	32	28
Male family labor(days)	84	96	70	44	10	8	0	0	88	47
Male hired labor(days)	43	52	0	0	70	85	86	85	31	23

[1] For gherkins and marigold all costs are for the most recent season completed, for one acre, which spans three months.
[2] For papaya, this is an annual figure that has been converted to an equivalent per month per acre.
[3] All costs and returns are in Rupees.

These differences point to the heterogeneity across crops and the need to acknowledge these differences in studying the instrumentality of contract farming in transforming smallholder livelihoods. The switching models offer a way to compare the above structural differences, in a limited way, between contract growers and non-contract growers in different schemes. Examining returns to factors of production for contract farmers also reflects key contractual elements. Given that all the contracting firms engage in offering technical advice, supervision and monitoring, and by supplying inputs, variables representing these aspects reflect the contribution of contractual inputs provided by the firm.

Returns to fertilizer use and family labor is statistically significant for marigold contract farmers, whereas these do not seem to matter to farmers who do not contract for marigold. For gherkins, farmers with larger landholding sizes are associated with greater net profit per acre as are farmers located farther from the road.

The presence of monitoring, denoted here as a dummy variable, does not seem to impact net profit per acre. Monitoring the production process is a very important aspect in the gherkins contracting scheme and is valued highly by the farmers. This result is somewhat surprising. However, it is possible that it is the intensity of supervision that matters rather than whether or not there is supervision.

In the case of papaya, contract and non-contract farmers earn higher profits per acres with plant protection, this is highly significant for contract farmers and is most likely owing to the mealybug infestation during the season surveyed. As with gherkins, farmers located farther away from the road tend to earn higher net profit per acre than those who are closer to a road. Larger size of farms tend to earn less net profit per acre from the contract farm. This is presumably due to the managerial demands made as the scale of operation increases. For those who do not contract for papaya, family labor inputs are associated with higher returns, and less educated and those belonging to marginalized communities fare worse. Plant protection for non-contract farmers is less significant than is the the case for papaya contract farmers.

more likely to contract. Further, the higher the variation associated with the realized prices paid by other contract firms for gherkins, the greater the likelihood of farmers wanting to contract with the sample firm in the study.

9.6 Concluding Remarks

The findings of the chapter underscores the variation in the treatment effects not only across contract farming schemes but also across farmers within a particular scheme. The net gains or losses that are associated with the participation suggest a complex pattern of sorting into schemes. While in broiler, it seems clear that farmers who do better than the average are selected, for gherkins it is evident that farmers who opt out of contracting do not have a comparative advantage participating.

The diversity and heterogeneity in sorting is valuable in the light of recent suggestions that from a public policy perspective, that one needs to recognize that there are diverse groups of farmers.Only a subset of them fare well participating in modern supply chains, others are likely to fare poorly irrespective of whether they participate or not. It is when farmers can do better with contracting, but are rationed out by the firm, that exclusion of farmers from contracting arrangements becomes a policy concern. As long as farmers opt out voluntarily, on account of perceived risks or because they fare better when not participating, there is less cause for concern with regard to farmer capacity to participate in schemes.

Chapter 10

Churning and the Dynamics of Participation in Contracting Schemes

This chapter offers a brief descriptive account of the dynamic elements in the contract farming schemes studied, focusing on churning in firm portfolios of farmers and procurement sheds. The goal is to highlight the fluidity in these systems.

The dynamics of farmer participation and temporal change in contract farming practice have been issues of monumental neglect despite widespread recognition of their importance. It is clear, and recognized as such in the literature, that firms might alter their portfolio of farmers based on experience and learning. Over time, those farmers who were contracting may be dropped and others who were not, included. The evolution of a firm's portfolio is only just beginning to get serious attention. Runsten and Key (1996b) find that multinational tomato processors in Mexico first contracted with large growers but then eventually involved also the small growers because side-selling was a problem with their larger growers. An exporter in Thailand that started producing its own horticultural products on company land later shifted to smallholder contract production (Minot and Ngigi, 2004). Herath and Weersink (2009) note that the Sri Lankan tea sector has changed from being dominated by vertically integrated plantations to one where processors source from from small, independent growers. Minot and Ngigi (2004) describe the evolution of several contract farming schemes in Kenya, including one (Del Monte pineapple) that gave up on contract production and others than have shifted from large scale to small scale production. The reverse, i.e., movement from small to large-scale suppliers could happen as well. For example, the Xiaobaiyang chain in Beijing is known to have shifted from 1000 to 300 processed food suppliers in two years as it centralized its procurement system (Hu et al., 2004). Dolan et al. (1999) show a consolidation in the export sector in Kenya with a sharp reduction in the proportion sourced from small farmers. In the case of processing, Farina et al. (2005) find a similar trend dairies in Argentina and Brazil.

Similarly, leading Russian chains focus only on a handful of foreign and domestic suppliers for dairy products (Dries and Reardon, 2005). In Senegal, green bean exporters switched from small-scale contract production to large-scale production (Swinnen and Maertens, 2008).

While changes in the composition of contract suppliers is one aspect, another is the survival rate of the schemes themselves. Yet, as Minot (1986, 2008) points out, the failure of contract farming schemes is high, but poorly documented. Rarer are studies that offer rigorous analysis of what drives these changes.

Analysis of contract participation at a given point of time is useful in its own right. It cannot, however, in itself provide a credible basis for policy making for contract farming, for which it is important to have information on dynamic outcomes, if only to help stave off potential catastrophic risks for the intended beneficiaries.

The first section of this chapter presents the recent contracting experience for two schemes, cotton and gherkins, using firm data on the geographies of procurements and attrition in farmer portfolios in the study region. The two present a contrast. The cotton contracting scheme did not survive beyond the year of the field survey, whereas the gherkins firm has been successful in securing volumes for processing.

The second part of the chapter uses data from the Farmer Survey to examine farmer entry and exit. This section also elaborates on two phenomena that have not received due attention in empirical research on contract farming. The first is the episodic nature of farmer participation in contracting arrangements, wherein a spell of non-participation is sandwiched between spells of contracting. The second relates to the intensity of participation. Extensive participation, judged on the basis of whether a farmer contracts or not, in binary terms, is only one aspect of participation. The notion of intensive participation refers to the degree to which a farmer participates, measured by the extent of contract acreage, proportion of contracted produce supplied, etc.

10.1 Firm's strategies

I present trends in the procurement patterns for two firms from Phase 1 representing the changing patterns for the cotton contract farming scheme and the gherkins contracting schemes (Figure 10.1). The two firms shared select data for multiple seasons.[1]

The two schemes present a contrast. The cotton firm started contracting with a lot of promise in 2004-05. By the time of the survey in 2007-08, however it was apparent that it would not survive. In the case of cotton contracting, therefore, the dynamism can be read equally as demise. While the main focus of the firm was to procure from particular cotton growing areas in Coimbatore district, this was restricted to the winter season. In 2007-08, the firm began to procure summer cotton from Salem district, and this is reflected in the increase in the number of blocks, villages and hamlets that year (Figure 10.1). Despite this expansion in procurement area, the contract acreage and the number of farmer-suppliers did not increase substantially, indicating possible farmer attrition in the Coimbatore region. By 2008-09, the firm had abandoned contracting in conventional cotton. An executive associated with the program declared "Contract farming in conventional cotton is an absolute flop everywhere."[2] The firm was planning to commence contract farming operations in organic cotton. As a newspaper reported "the mill sector has lost its initial enthusiasm for the concept".[3] Most of the spinning mills that embarked on contract farming operations in 2003-04, had abandoned contracting by 2008-09, save as Corporate Social Responsibility initiatives.

The gherkin firm, in contrast, has endured. In this case, the dynamics of a scheme reflects adaptation and changing strategies, without destabilizing the contract farming scheme itself. It is interesting that while the numbers of contract hamlets, villages and blocks or even contract farmers in the study area have not declined dramatically, the volume procured from the study region has seen a comparatively marked decline, indicating decreasing volumes procured per farmer (Figure 10.1).

[1] In general, obtaining information on procurement volumes and farmer-specific information over several years is extremely difficult. The firms did not share all the details and data gaps were filled through interviews with executives of the firm. This section uses select variables to demonstrate the dynamics of the two schemes.

[2] Agribusiness Survey, Coimbatore, Tamil Nadu, November 2008.

[3] L.N.Revathy "Mills losing interest in cotton contract farming" in Businessline, July 9, 2010. http://www.thehindubusinessline.com/2010/07/09/stories/2010070954411800.htm. Accessed July 9,2010.

Interviews with executives of the firm indicate the firm's strategic shift to new geographies for procurement. At the time of the survey, the gherkin processor was sourcing a majority of gherkins from outside the study area, moving to the east and south of the study region. This was partly on account of the stiff competition from other gherkin processors located in and around Dindigul town. The other reason, according to an executive with the firm, is declining yields from the "old areas".[4] It reflects too the effects of the economic downturn in importing countries, that saw fewer international orders, so that the firm reduced total procurement nationwide in 2007-08 and 2008-09.

The two examples above suggest the temporal fluidity of contracting arrangements in a given region. It is worth recalling that Chapter 3 elaborated on the Aokian notion of institutional evolution as punctuated equilibria, suggesting that the dynamic elements of a contract farming scheme can be either a consequence of a discrete exogenous change or can be a more gradual adjustment process reflecting the contracting firms' evolving strategies and farmers' learning. The case of cotton represents a failure of contract farming as an institution to take root, lacking a critical mass and stability of mutual expectations required of agents playing the game.

10.2 Churning

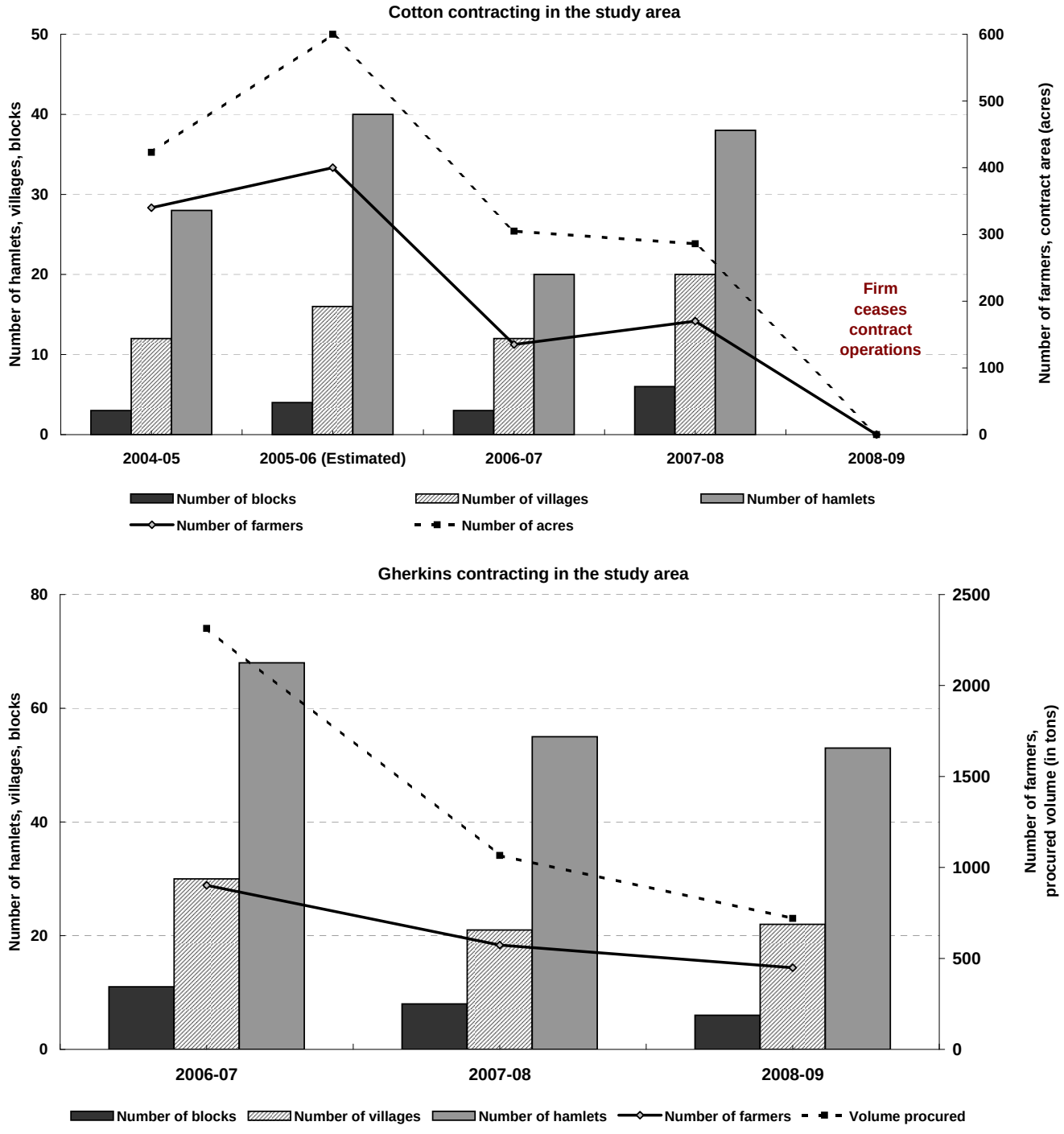
The dynamic of participation includes both addition and attrition, or entry and exit, collectively referred to as 'churning' in the labor economics literature. This section draws on survey data to suggest that even while firms select over geographies, this is not the only source of dynamism. There could be considerable variation over time in the nature of participation among farmers within a contract village.

10.2.1 Attrition

In general, for any contract commodity, there could be a number farmers exiting the system or farmer attrition. The key to stable contracting schemes is to maintain attrition rates below threshold levels. This section presents data from two databases for all the five commodities studied over the two survey phases. The houselisting process mapped the participation of households in

[4] Agribusiness Survey, Dindigul, Tamil Nadu, November 2008.

Figure 10.1: Contracting in the Study Area: Firms' Histories



the sampled hamlets comprehensively. While these are not presented in detail here, there was no contract hamlet or village that was sampled that did not have at least a few attrition farmers.

Data from the Farmer Survey indicates that there exists a wide variety of reasons for farmer attrition (Table 10.1). Some involve the firm terminating the relationship, when they drop villages or when they drop farmers from their portfolio. While farmers might not be candid with admitting that they were dropped by the firm (especially, for cotton and gherkins), several confess that they are unable to deliver contract commodity of the quality that the firm requires, notably for broiler and gherkins, leading likely to higher rejection rates or to the firm dropping the farmer altogether.

There is strong evidence here of farmers facing a disconnect between realized outcomes and expectations. Other than for broiler, a considerable proportion of attrition farmers state that the profits were not as high as anticipated, and that this was a reason for exit (Table 10.1). Other reasons for exit include excessive demands on family labor, limited availability of hired labor at low wages and yield losses. Personal circumstances constitute idiosyncratic reasons for farmer attrition. As Chapter 7 indicated, perceptions of detrimental impacts on soil quality and health appear serious enough to drive some farmers to exit contracting. Finally, a set of issues that pertain to perceived performance of the contracting firm, in terms of timely delivery of quality inputs, proper payment, and so on, also triggers farmer attrition from contracting schemes.

10.2.2 Addition

The notion of entry and exit have an element of time and duration that is not adequately acknowledged even in studies that draw attention to the dynamics of contracting arrangements. There is often a time lag between a farmer's recognition of an opportunity to contract and actually being willing and able to contract. In this sense, time taken to enter a contracting scheme is both a product of and cause of friction.

Figure 10.2 graphs the Kaplan-Meier survival estimates, that are non-parametric estimates of the population survival function and is appropriate for censored data (Kaplan and Meier, 1958). The function

Table 10.1: Attrition: Why did farmers exit?

Reason for attrition	**Percentage of Attrition Farmers citing the reason**					
	Gherkins (Phase 2)	Marigold	Broiler	Cotton	Gherkins (Phase 1)	Weighted Average
Not as profitable as anticipated	17	11	0	44	18	20
Labor costs too high	9	25	0	10	20	16
Too much labor required	14	21	0	7	21	16
Low price for output	0	23	0	2	3	7
Improper payment by firm	3	4	53	2	0	6
Soil quality deterioration	17	4	0	0	5	5
Rain related yield loss	3	0	0	15	5	5
Firm stopped contracting in the village	0	0	0	15	6	5
Pest problem	14	0	0	2	2	3
Farmer unable to maintain quality standards	0	0	20	0	5	3
Poor quality of inputs	0	2	20	0	3	3
Health issues	9	4	0	0	0	3
Inadequate or poor technical support from firm	0	2	0	0	6	2
Firm refused me a contract	3	0	0	0	5	2
Personal reasons	6	0	0	0	3	2
High cost of cultivation relative to other crops	0	5	0	2	0	2
Water problem	6	0	0	0	0	1
No advance or credit available	0	2	0	0	0	1
Delay in input delivery	0	0	7	0	0	0
Number of responses	35	57	15	41	66	

[1] No papaya attrition farmer was interviewed. Hence, papaya is not included in the table.

$$S(t) = (n_j - d_j)/n_j$$

where $n_j i$ is the number of observations at risk at the beginning of time j and d_j is the number who transition status or do not survive. Here, where the hazard here is defined as initiating a contractual relationship with the sample firm, so that those at risk refer to the sample farmers who have not yet initiated contracting. It shows the proportion of sample farmers who have not entered the system as of a particular time. The X-axis shows the number of years beyond 1990. The figure shows that broiler and papaya are relatively recent schemes, with the first contracting farmer enters the schemes relatively recently. Marigold is the oldest scheme as far as the sample villages are concerned.

Figure 10.3 shows that several years often pass between a contract farmer becoming aware of the contracting option and entering into contracts. This could be partly on account of the firm not selecting them in the first instance, or that the farmer is circumspect about the arrangements and waits to learn from others' experience. The commodity specific kernel density estimates indicates that for commodities that farmers are familiar with, especially cotton, broiler and papaya, a majority of the sample farmers began contracting within three years of becoming aware of the option. For gherkins, an exotic crop in the study area, there is much more variation, and some farmers took more than a decade to go in for gherkins cultivation. Marigold too has a similar time span. This could be due in part to the fact that the spot market for marigold flowers was attractive enough for farmers. Modeling time to entry as a function of farmer and contract characteristics could yield valuable insights into the dynamics of adoption, and is an area for future investigation.

10.3 Episodic Participation

Episodic participation is perhaps the least studied phenomenon in the context of contract farming. In general, there is nothing about the nature of contract farming that implies constancy as far as participation is concerned. Most contracts tend to be for a season and even for tree crops the

Figure 10.2: Initial entry time across schemes

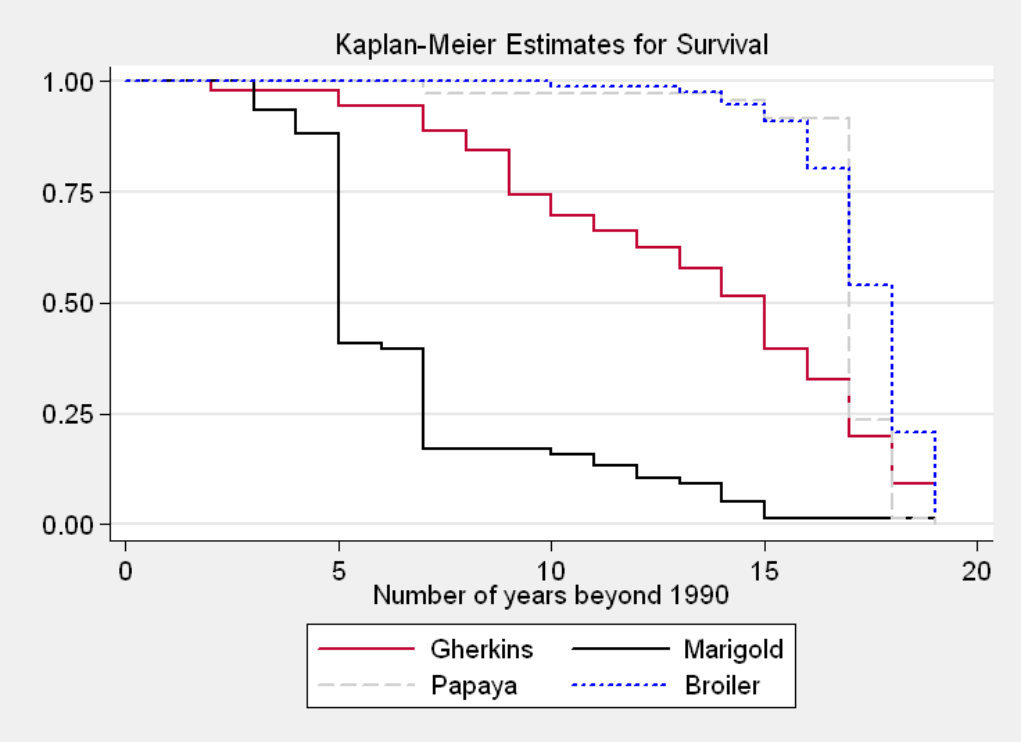
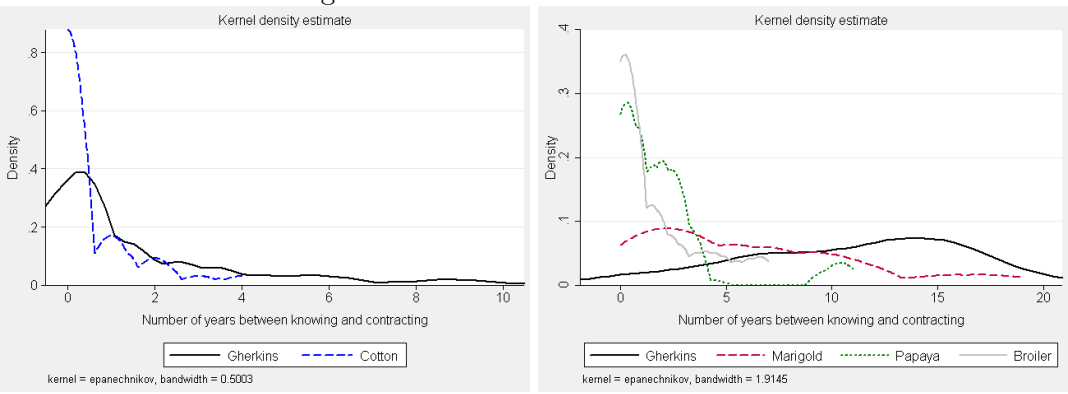


Figure 10.3: Time taken to contract: Phase 1 and 2



contract is for about three years at the most. In the area of study, farmers can potentially grow a contract crop three times every year. The commodities selected for study, namely cotton, gherkins and marigold, are three month crops. Broiler has a six week cycle with a prescribed gap of one fortnight between cycles. Only papaya is a three year crop, with an eight month gestation period and returns that vary over the life cycle of the tree.

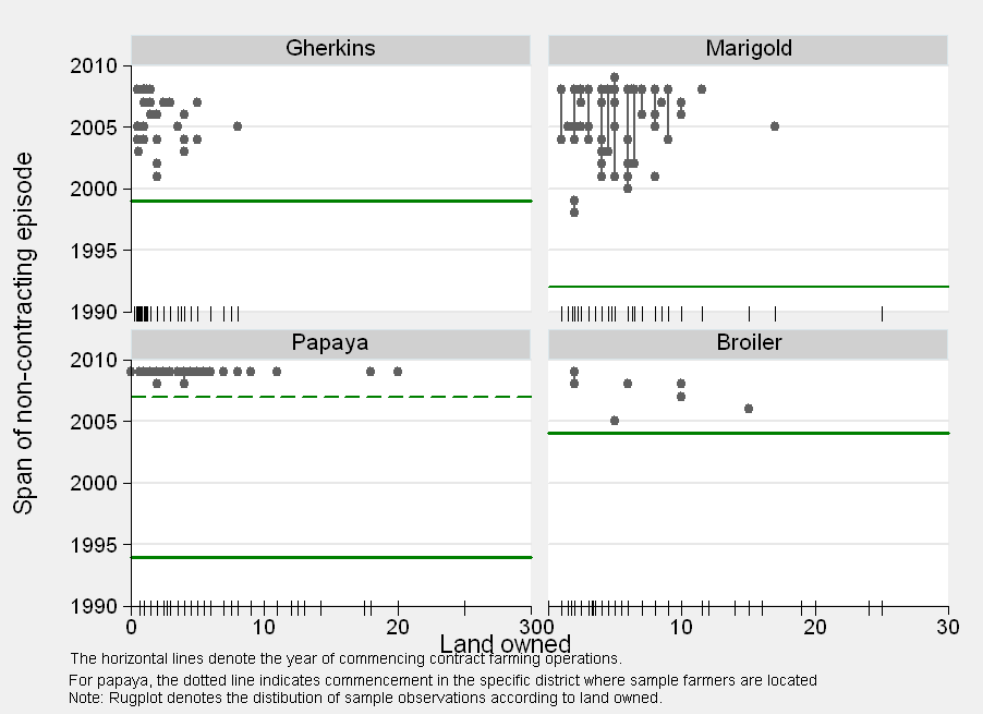
Almost universally, even when firms are willing to offer contracts every season, farmers who contract prefer to contract only for a subset of the seasons, opting not to contract the rest of the year. Importantly, a contract commodity has a very specific place in the farmer's annual cropping pattern and portfolio, wherein there are a set of competing cash crops that farmers move in and out of over the year. Over the longer term too, farmers' participation in contracting is often episodic, where a spell of not contracting can be sandwiched between two periods where the farmer is contracting for the commodity. Table 10.2 shows that 46% of contract farmers reported that they had breaks in their contracting history. It is as low as 8% for broiler and as high as 73% for marigold farmers. The former reflects both the level of fixed investments required and the fact that broiler farmers have begun contracting only recently. In the case of papaya, breaks from contracting indicate spells when no latex was extracted.

Figure 10.4 presents the duration of breaks in the contracting history of sample farmers. This is plotted against land owned, to map the prevalence across classes of farmers, and the rug plot shows the density of observations according to land ownership. It is clear that a number of gherkin and marigold contract farmers have had breaks in their contracting history. [5] In the case of gherkins, there is a fair spread across time. For marigold, on the other hand, most spells are clustered around 2004 to 2008, several ending in 2008. For broiler and papaya, such breaks appear less common, and seem to be of shorter duration, typically, less than a year.

The reason for episodes of not contracting could be on account of the firm's withdrawal or the farmer opting out. The Farmer Survey mapped the reasons for breaks in contract (Table 10.2). In many instances, the episodic nature of farmer participation is governed by the ebb and flow of the international orders downstream that the processing firms get, implying that there are years

[5]The sparseness of contract breaks among the larger classes of farmers here indicates sparseness of observations.

Figure 10.4: The Episodic Nature of Participation



when the pool of contract farmers shrinks. About 28% of those with breaks declared that the firm had not offered them contracts. In particular, the pattern for marigold, which saw breaks clustered between the years 2004 and 2008 mark the time when the firm had few export orders and had scaled down operations considerably. In many other instances, the individual farmer often opts out of the contract crop, either willingly, responding to potentially high profits for a competing crop, or involuntarily, when personal circumstances of the farmer, for example, illness of family members, poses particular constraints on contract cultivation.

Such episodic participation especially when the termination of spells is from the farmer's end renders the notion of participation fuzzier and participation acquires the sense of a repeated event.

10.4 Intensive Participation

Intensive participation refers to contractual volumes or quantities or contract acreage that a farmer and firm agree to for a given contracting season. Churning, i.e. entry and attrition, on the other hand, has to do with extensive participation. Sometimes, firms might choose to work on

Table 10.2: Episodic participation

Percentage of farmers contracting with any firm reporting episode of non-participation		
Commodity	**Percentage of total respondents**	**Number of respondents**
Phase 2		
Gherkins	44	77
Marigold	73	59
Papaya	43	72
Broiler	8	71
Phase 1		
Gherkins	49	98
Cotton	55	58
Reasons for the break in contracting for those with episode of non-participation		
Reason	**Percentage of total responses**	**Frequency**
Firm did not offer contracts	28	34
Water issues	18	22
Pest issues	16	20
Losses with contract crop the previous year	11	14
Low contract price	9	11
Wind and weather issues	4	5
Contracted with another firm	3	4
Grew for the spot market	2	3
Health issues	2	3
Went away from village	2	3
Death in the family	2	2
Labor shortage	2	2

[1] Farmers were allowed multiple options to capture all the relevant reasons for the break.

the intensive margin rather than on the extensive margin so that the additional (or differential) contractual volumes work on intensive participation rather than with number of farmers or regions in the firm's portfolio. The notion of intensity of participation is important because it can disrupt notions of small-big farmer dichotomies in complex ways. Assessments of small farmer inclusion could then be cast in terms of the proportion of contracted produced in a given season sourced from small farmers. For instance, even in instances where,say, 80% of the firm's portfolio of farmers are smallholders, they might account for only 20% of the total volume contracted.

The intensity of participation not only limits the usefulness of small versus large farmers as useful analytical categories, but evidence from India suggests that this turns out to be an arena for a contracting firm's strategic action that is often neglected in empirical work. This is especially relevant when firms adjust portfolios over time. In the Agribusiness Survey, for instance, several firms said that they prefer to focus on yield improvements on a low acreage base to secure large volumes from a limited number of small farmers rather then expanding on the extensive margin. A related question is who becomes the shock absorber among contract farmers, when firms reduce procurement volumes.

Figure 10.5 shows the change in intensity of participation of the entire portfolio of contracting farmers for the years 2007-08 and 2006-07. The figure shows a fitted curve, with the change in a contract farmer's contract acreage plotted against the initial acreage under the contract crop in 2006-07.[6] It is apparent that smaller farmers have expanded acreage under cotton contracts whereas the larger farmers have on average reduced the acreage devoted to contract cultivation. This could be due to a combination of factors. First, it could reflect learning, and perhaps gravitating to an optimal ratio of contract and non-contract acreage. Some farmers might have started off experimenting on a small area and given a positive experience, might have expanded the contract acreage, the reverse holding for those who started with larger contract acreage. It could also be that larger farmers are contracting a small acreage but are growing cotton for the open market as well. In field visits, many cotton farmers considered the advice provided by contracting firms to

[6]This includes only those farmers who have contracted both years.

be very valuable and it could be that they are leveraging this to increase yields on all cotton plots, while retaining access to the spot market which makes fewer demands on quality.

Figure 10.5: Cotton Contracting: Fractional Polynomial Fit for Changing Intensity of Participation

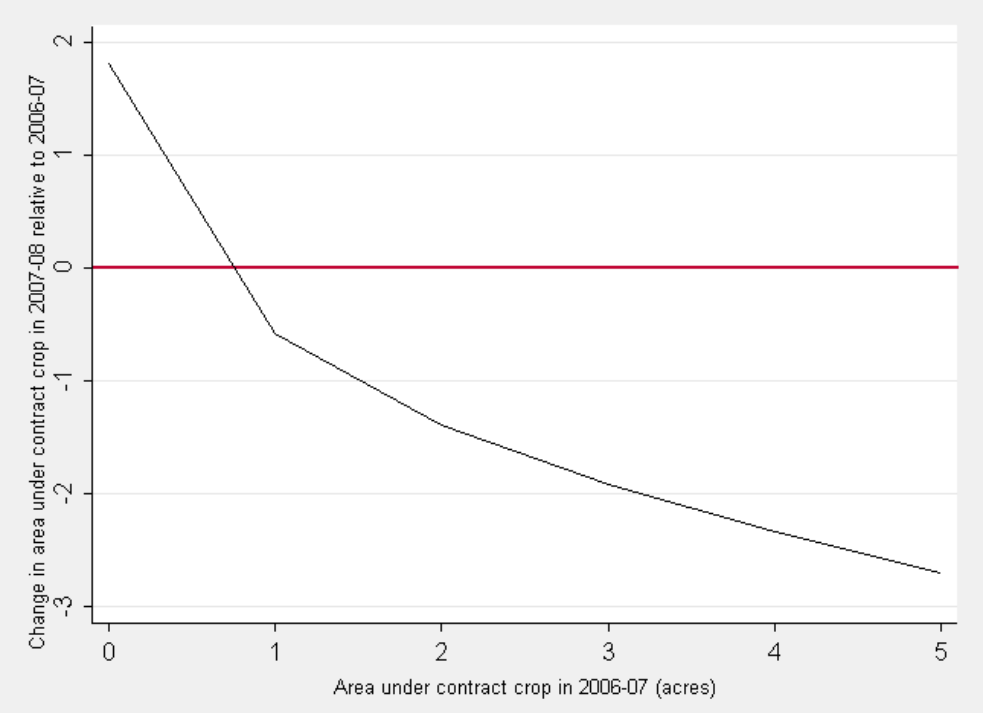


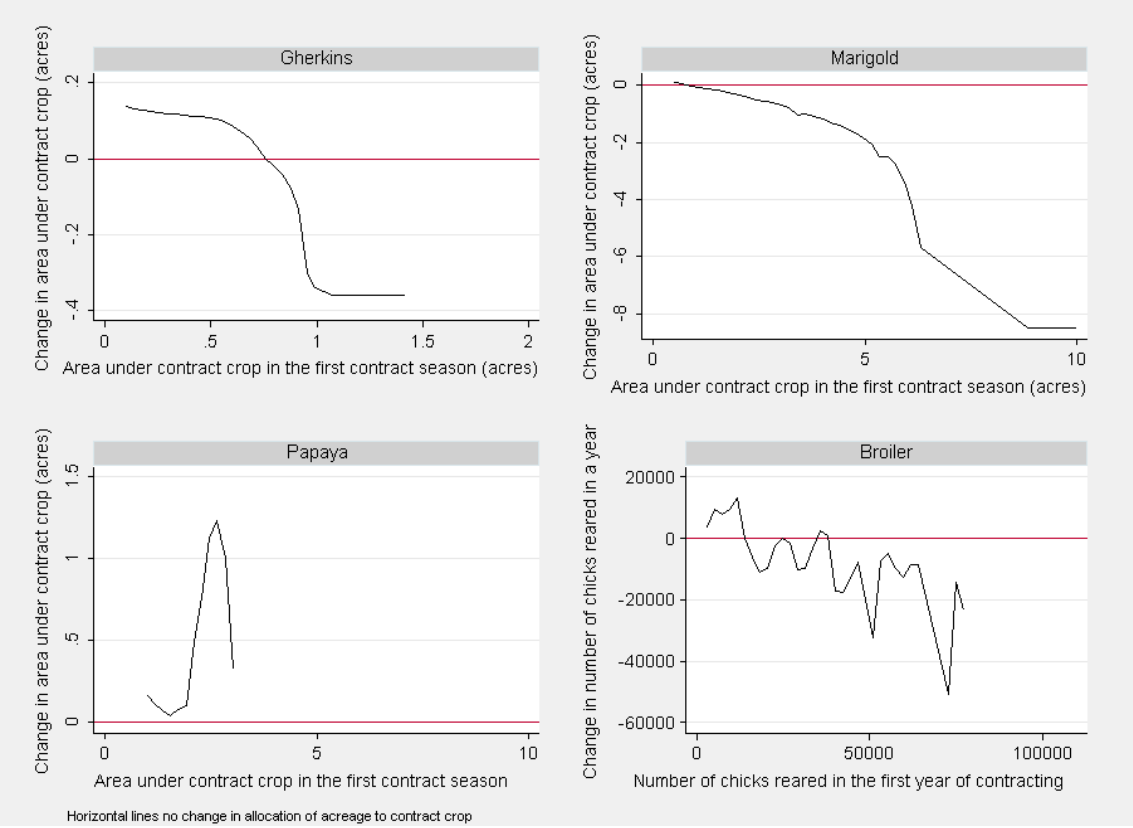
Figure 10.6 shows fitted plots for each of the other contract commodities. These are, however, based on the survey data and do not have the same interpretation as Figure 10.5, which was based on contracting histories supplied by the firm. In particular, Figure 10.6 plots the change in an individual farmer's intensity in participation, of the most recent contracting year relative to the farmer's first year of contracting. Since different farmers in the sample entered the system at different points of time, these figures do not reflect a firm's strategy. Nor is it sensitive to the exogenous context in terms of the general economic conditions, volume of procurement and so on.

Tellingly, for gherkins, marigold and broiler it appears that farmers who have increased intensity of participation are those who started off with a low intensity of participation. Those who devoted greater acreage or took in more chicks in the first year of contracting appear to have lowered these in the most recent year of contracting. In the case of broiler, although this relationship holds

broadly, there is much variation. As for marigold, there is no instance of farmers increasing acreage under marigold contract relative to their first year of contracting.

Papaya is the clear exception. Papaya farmers appear to have added acreage since they first began contracting. The figure needs to be interpreted with caution. The observation period is only four years, and for a contract that is three years, it is premature to identify trends. Also, this expansion does not reflect the mealybug infestation that had taken hold just prior to the survey. When this is factored in, it is certain to reflect in the intensity of participation of contracting farmers more accurately.

Figure 10.6: Changing Intensity of Participation among Contract Farmers



10.5 Concluding Remarks

This chapter mapped the fluidity of farmer participation in the contract farming schemes selected for study. One goal was to highlight the dynamic elements in the schemes. It offers a cautionary

story against generalizing from research that focuses on static participation and welfare gains. The second goal was to complicate static, binary notions of participation, highlighting in particular the phenomena of episodic participation as well as the intensity of partipation. While the chapter did not seek to model these phenomena so as to generate causal explanations, it shows that one needs to pay due attention to the dynamics of contract farming schemes, while assessing the normative implications of contract farming for public policy. It highlights the need to track farmer-level and scheme-level variation in participation over time and to model these rigorously. If empirical research is to serve as a credible basis for contract farming policy, it would have to take the dynamics of these systems seriously.

Chapter 11

Relationship Farming: The Problem of Enforcement

11.1 Introduction

The chief problem with contract farming schemes in India stems from enforcement issues (Asokan and Singh, 2003; Gulati et al., 2008; Jain, 2008). Weak public institutions for enforcement give latitude to both farmers and firms to renege on the contract and parties inevitably resort to various forms self-regulation and other private means of enforcement to maintain transactional relationships.

It is common, therefore, to see policy discussions urging establishment of legal and institutional mechanisms for enforcing contracts between agribusiness and farmer. These prescriptions are predicated on the notion that developing a legal framework for contracting and enforcement is desirable, even necessary, to enable expansion of contract farming relationships and would provide incentives for both farmer and firm to enter into formal, legally valid agreements.

This chapter interrogates the prescriptive logic that sees legislative mechanisms as the main vehicle for resolving contractual disputes, arguing, as others before have done in other contexts, that legislative mechanisms might be neither necessary nor sufficient for maintaining agribusiness-farmer relationships. The central argument of this paper is that this view is at odds with the empirical agrarian context in India, where agents - both farmers and firms - express a reluctance to develop formal contracts with legally binding obligations, preferring to continue with transactions outside the prescribed legal-institutional structure. While exploring the many reasons for this reluctance, this study suggests that the presumed efficacy of legal institutional development neglects the more complicated role that legal systems play in the midst of other,'informal', regimes of enforcement in Indian agribusiness, as it does the particular relevance of socially-embedded relationships for contractual performance.

This chapter offers a broad analysis of contract and enforcement in select contract farming schemes in India, examining the role of relationship in contract farming schemes, using qualitative and quantitative data from the Farmer and Agribusiness Survey.

11.2 The Prescription and its Logic

Recent years have seen enormous emphasis placed on developing strong and effective legislative frameworks for contract enforcement and dispute resolution in India with a view to creating favorable conditions for the growth of contract farming. These recommendations have taken many forms.

In 2003, the Government of India proposed a Model Act (The State Agricultural Produce Marketing Development and Regulation Act), which outlined a framework for contract farming operations that would safeguard the interests of both firms and farmers. States were urged to adopt this legal framework to enable rapid growth of contract farming.[1] The Model Act provided for registration of all contracts and a thirty-day window for resolving contractual disputes. The World Bank (2005) too believes that the "government can foster the development of contractual arrangements by facilitating the creation of producer organizations, *legislating an appropriate contract law and enforcing it effectively*" (emphasis added). The US-India Knowledge Initiative (KIA)[2], a bilateral program in agriculture, suggests that "legal mechanisms for contracts and alternative mechanisms for regulating contracts would be evolved based on the American experience"(Kuruganti, 2008). There have also been calls for regulating contract farming so that firm-farm relationships are more "equitable and farmer-centric" than at present.[3] This is a cross-section of opinion with diverse ideological content that emphasizes legislation to varying degrees as a way to foster contract farming

[1]In India, agriculture is a State subject, so the legal provisions regarding contract farming would be State-level laws rather than a federal-level or national law.

[2]The U.S.-India Knowledge Initiative on Agricultural Education, Teaching, Research, Service, and Commercial Linkages (AKI) was initiated on July 18, 2005, with the United States, with secured funding of $8 million in fiscal year 2006 and a total of $24 million pledged through 2008. (http://www.fas.usda.gov/icd/india_knowl_init/factsheet.asp, accessed October 23, 2008)

[3]The National Commission on Farmers (Third Report, 2006), for instance, advocates a Code of Conduct for all agribusinesses engaged in contract farming, that would pay special attention to clauses dealing with quality standards, withdrawal conditions, pricing standards, paying arrangements, acts of God clauses and arbitration mechanism.

arrangements, under the implicit assumption that legislation would in fact encourage actors to enter the legal fold to transact while protecting poor farmers.

Interestingly though, even where such mechanisms have been introduced in credible ways, they have not met with success. In Maharashtra, for instance, four months after an 'appropriate law' with a blueprint for enforcement was put in place, the officer overseeing proposals had failed to receive even a single proposal.[4] "Earlier, contracts between companies and farmers were not governed by a dedicated Act. Now, we have the Act which stipulates rules that have to be followed. But contracts are not being signed under this Act." (Ghadyalpatil, 2008) This is not unique. In states where the Model Contract Farming Law has been adapted, the response of firms to undertake contract farming schemes within this framework has not been encouraging (Ghadyalpatil, 2008; Gulati et al., 2008).

Why is there a disconnect between the perceived merits of legislative frameworks and actual practice? What explains the reluctance of agribusinesses in India to respond to state initiatives to promote formal contract farming? These questions invite us to examine the more fundamental issue of the role of 'formal' or third party enforcement in supporting economic exchange.

It has long been recognized within economics that markets need to be supported by institutions for economic governance. Institutional creation and maintenance was a role left to the state, by even the most libertarian of economists, like Friedman (1962). Traditional economics typically veered to the view that the framework of law is a necessary condition for the market to succeed, for, in its absence, unbridled opportunistic behavior could lead to dysfunctional societal systems. Another view, derived from Coase (1937), went further to suggest that such a legal framework might even be a sufficient condition, so that as long as property rights are well-defined, in the absence of transactions costs, voluntary economic exchange would follow as a matter of course and produce optimal welfare outcomes.[5]

Correspondingly, in the development literature, early views associated 'development' with a

[4]The credibility of these interventions is important. In a transition economy, new initiatives might take some time to take root and intended beneficiaries might lack faith in the institutions that oversee these initiatives. While this typically contributes to an initiative's lack of success, in the example cited in the text, the firms articulate a different concern, which is central to the preoccupations of this paper. This is taken up specifically in a later section.

[5]Admittedly, in the context of Indian agricultural relations, this Coasian view was never admitted seriously into discussions, given the high transactions costs.

move from relation-based transactions to rule-based transactions, or from custom to contract and informality to formality.[6] This strand is evident in more recent works, like those of de Soto (2000) and Acemoglu et al. (2005), who see well-defined property rights as fundamental institutional preconditions for 'development' (Harriss-White, 2008).

To the extent that contracts assign *relative property rights* and given that institutions that enforce these contracts protect these rights (Furubotn and Richter, 2005), 'development' itself is associated with the establishment of such enabling institutional frameworks that accommodate formal contracts. Prescriptions that emphasize the installation of legal mechanisms to enable contract farming are aligned closely with this tradition of legal centralism and a positivist-formalist understanding of contracts.[7] They privilege the view of a rational state that oversees economic exchange in a non-partisan and costless manner. These prescriptions thus retain validity insofar as the non-trivial assumptions that inform these theoretical viewpoints hold in reality. As I argue below, this is far from self-evident. In short, there is often a schism between institution design and use.

11.3 Enforcement as Theoretical Subject

The challenge to the above positivist-formalist view comes from various quarters. Among these is the natural and intuitive critique that transactions costs do exist and influence forms of economic governance structures. Furthermore, the state (or judiciary) is itself socially regulated, far from being an informed, non-partisan, omniscient arbiter.[8]

The presence of transactions costs then implies a search for an economic governance structure (in this case, an enforcement mechanism) that minimizes these costs (Williamson, 1996). A number of

[6] As Harriss-White (2008) points out, each of the classical political economists - Smith, Marx, Weber, Veblen, Schumpeter and others - expected archaic forms of exchange to be *replaced* by markets, the struggles of wage labor against exploitation and illusion, and the rationality of state bureaucracy and planning, and by the discipline of machines, technology and education, respectively.

[7] The core of legal centralism presumes contractual conflicts are costlessly decided by well-informed courts in an objective, legalistic way. See Griffiths (1986) for a detailed discussion.

[8] The transactions costs economics view or the NIE view is thus not the only critique. Economic exchange represents a complicated subject where law, economics and sociology intersect. For instance, sociologists fault the legal-centric view for being "under-socialized" in ignoring the social embededness of transactions (Granovetter, 1985) and the role of social networks and norms. In this study, I choose to retain a somewhat narrow focus, adopting the NIE line of critique.

enforcement mechanisms outside of the state are, in fact, available to parties engaged in economic exchange and governance is not always carried out by government. Taxonomies of enforcement mechanisms classify these modes of economic governance either as private ordering versus public ordering depending on the role of the state, or as first, second or third party enforcement (Dixit, 2004).

First party enforcement operates at the level of the individual. Norms of behavior are internalized so that reward for compliance or punishment for deviation takes the form of moral or social imperatives (Dixit, 2004). Platteau (1994a,b) elaborates for instance on the role of 'generalized morality', while Fafchamps (2004) discusses incentives to comply driven by shame and guilt.[9]

Second party enforcement refers to bilateral and multilateral links with other members of the same community or network, for relationship-building and punishment. Bilateral relationships recall the notion of a repeated game setting between two players and of the Folk Theorem result, where short term gains from defecting are overshadowed by long-term gains from cooperation (Kandori, 1992). In the case of multilateral enforcement, the group collectively sanctions deviant behavior on behalf of the aggrieved player. Greif (1993) studies Maghribi trader coalitions that supported the operation of a reputation mechanism to tackle agents' commitment problem, and Genoese traders' use of merchant guilds. Milgrom et al. (1990) look at the role of merchant courts in the Champagne fairs of medieval Europe as institutions for enforcement. Establishment of credit reporting bureaus is a contemporary example(de Janvry et al., 2010).

Third party enforcement is a broad term that refers to an outsider-arbiter, who is not directly involved in the transaction. In game-theoretic terms, this third party essentially transforms a one-shot game between two players into a repeated game of each player with a third party. Third party enforcement is traditionally thought of as enforcement by state agencies, e.g., courts or quasi-judicial entities. The literature on enforcement has now come to recognize this category as being immensely diverse. The third party could adjudicate privately in the shadow of formal law, as "private government"(Dixit, 2004) or it could be for-profit direct enforcement (as in the case of

[9]Kolm (2000) makes the distinction between moral and social imperatives. Guilt for violation is moral but shame is social.

the mafia (Gambetta, 1996)). Another kind of third party enforcement could simply involve the provision of information to various players who then use this as the basis for sanctioning, so that the third party facilitates second party enforcement (for example, credit and quality certification agencies).

The plurality of enforcement mechanisms implies that the choice of means of enforcement rests on the assessment of relative transactions costs, following Williamson's "discriminating alignment" hypothesis (Williamson, 1996). State mechanisms for contract enforcement are then neither the only mechanisms available nor the most important. In fact, state institutions might be neither sufficient nor necessary for economic exchange.[10] Further, the different means of enforcement (formal and informal) are not mutually exclusive categories; state enforcement, for example, is often embedded in other forms of enforcement (Barzel, 2002). Such a "mixture of both formal and informal relations" (Macneil, 1980) is common across diverse contexts and empirical studies observe that the different means are jointly employed to support diverse kinds of exchange (Macaulay, 1963; Bernstein, 1992; Guo and Jolly, 2008; Johnson, 2002; Johnson et al., 1999; Lane and Bachmann, 1996; Maze and Menard, 2010; Poppo and Zenger, 2002).

These formal and informal mechanisms of enforcement could interact in complex ways, in particular, as complements, where, formal mechanisms strengthen informal enforcement, or as substitutes, where, formal mechanisms replace informal private mechanisms and could potentially undermine or replace self-enforcing arrangements (Lazzarini et al., 2004; Poppo and Zenger, 2002). The complementarity view suggests that the joint use of formal and informal arrangements provides more efficient outcomes than the use of either arrangement in isolation. For instance, third party enforcement by the state provides a backstop for second party enforcement mechanisms (Klein, 1996, 1985; Lazzarini et al., 2004). Complementarity arguments assert, too, that formal contracts through incentives or punishments can reduce gains from short-term defection thereby increasing

[10] For example, Gow et al. (2000) demonstrate that in the Slovak sugar industry self-enforced contracts in the absence of public or third party enforcement increased productivity and efficiency. McMillan and Woodruff (2000, 1999) elaborate on the role of private enforcement for businesses in Vietnam, Otsuka et al. (1986) study the Philippines, Clay (1997) discusses mining rights during the Gold Rush in California and Ellickson (1991) discusses boundary and cattle trespass disputes in Shasta County, California.

the value of honoring informal dealings, what Klein (1996) refers to as the "self-enforcing range of agreements".

In general, the complementarity view has often taken precedence in discussions of agrarian transactions in developing countries (Fafchamps and Minten, 2001; Maze and Menard, 2010). However, formal contracts can also have a significant "motivation crowding effect" or substitution effect. The prospect of punishments could discourage an individual's voluntary compliance based on reciprocity norms, thereby damaging the quality of exchange outcomes (Macaulay, 1963; Malhotra and Murnighan, 2002; Sitkin and Roth, 1993). Sitkin and Roth (1993) caution that "legalistic remedies can erode the interpersonal foundations of a relationship they are intended to bolster because they replace reliance on an individual's good will with objective formal requirements." Likewise, Macaulay (1963) stresses that detailed negotiated contracts get in the way of creating good exchange relationships between business units. In essence, rules can compromise the 'handshake ethic'.

These theoretical insights on the plurality of enforcement mechanisms and their complementarity and substitutability offer an appropriate lens to examine agribusiness practice of contract farming in India. In particular, the tension between the 'motivation crowding out' effect and complementarity effect is especially valid in the context of enforcement in contract farming systems in India.

11.4 Enforcement, Enforceability and the Contract

References to Indian customs in early Greek literary sources during the time of Herodotus (5th Century B.C.) suggest that Indians had a reputation for seldom going to law to settle disputes (Singer, 1972). This rings true for agribusiness in contemporary India as well, where contractual relationships are seen more as relationships and less as contracts.

In conversations with agribusiness executives in India, the very mention of the term 'contract farming' evokes passionate response. One executive pointed out "We don't do contract farming, we do relationship farming".[11] Another interjected "I call what we do *contact* farming" leaning

[11] Agribusiness Survey, Hyderabad, Andhra Pradesh, 2007.

forward to ensure one did not miss the point. "We have contact with the farmers, there is no written contract; it is by word of mouth, based on mutual understanding" he elaborated.[12] Yet another said, "I would prefer you called it corporate-linked farming".[13] Each phrase used to describe their procurement strategy negates the idea of formal contracts that are enforceable by law.

Their careful rewording also suggests that these firms' executives view firm-farm transactions as a problem of relationship maintenance rather than of contract enforcement. On the one hand, a combination of a languid legal system and the sheer number of farmers involved offers little prospect of economical public enforcement of contracts, pushing firms to rely on informal mechanisms. Indeed, this lies at the heart of arguments that advocate establishing formal, legal mechanisms for contract enforcement. However, on the other hand, even with a hypothetical legal system that works efficiently for agribusinesses in India, the social context of contract farming and the inherent nature of agricultural transactions bestows judicial options for enforcement with limited value. This comes partly from difficulties of non-observability and verifiability of contracts and partly from farmer perceptions of formal legal modes of economic exchange, which could crowd out personalized transactional relationships. The following sections investigate how, in this empirical context, a combination of these elements drive agents to choose certain modes of contracting and enforcement over others.

11.4.1 The Question of Enforceability

First, there is the question of whether the contracts used in contract farming schemes in India are enforceable at all. Given the nature of agriculture, it is virtually impossible to fashion a contract that provides for all possible contingencies in a way that is verifiable by a third party. Contracts are, therefore, invariably incomplete. As an executive observed "Our problem is, these contracts are not actionable. There is nothing we can do in the event of a breach."[14] Some contractual obligations are only imperfectly observable at the farm level or have a very high cost of detection - like the farmers' use of recommended practices or even side-sale of contracted produce. A firm that

[12] Agribusiness Survey, Hyderabad, Andhra Pradesh, 2007.
[13] Agribusiness Survey, Mumbai, 2007.
[14] Agribusiness Survey, Hubli, Karnataka, 2008.

contracted for marigold (by acreage) in southern India explained how side-selling of the flowers was rampant, especially during the festival season, when the open market prices shot up relative to the contracted price. "Every contract farmer is sending our flowers from the contracted acreage to the open market; each of us has at least fifty farmers to look after, we cannot be in every farm at the same time to detect that."[15]

Such *de facto* non-observability and non-verifiability then renders the outcome of judicial enforcement highly uncertain. Dispute resolution in this case is a probabilistic outcome. A legally binding contract does not offer the kind of guarantee it would for less complex transactions in manufacturing or services. This, in effect, undermines the Weberian notion that "legal guaranty gives a higher degree of certainty that the promise will be kept"(Weber et al., 1978, page 667).[16]

However, it is not merely the lack of predictability of dispute resolution outcomes that is a problem. A shared perception holds among a number of firms that the judiciary in India would give the farmer the benefit of the doubt for political reasons. Especially in a context where the might of large agribusinesses dwarfs a smallholder's power, dispute resolution is widely perceived to be pro-farmer. Essentially, agribusinesses perceive it to be hard to get verdicts against the farmer. As an executive observed "in India, corporates have to be very careful; in any dispute between a farmer and corporate, the firm is always assumed to be the culprit".[17]

The problem of enforceability also arises from the way contracts are written. This is not so much an economic perspective of contracts as it is a legal perspective. Still, it has implications for the economic analysis of transactions, since it renders judicial proceedings stochastic.[18]

[15]Agribusiness Survey Thalavadi, Sathyamangalam, Tamil Nadu, June, 2009.

[16]The certainty that comes with legal guarantee is what led Weber(1922/1978 edition) to suggest that it would be possible to expand the sphere of voluntary economic exchange because this higher certainty would enable people who did not know each other to transact with one another.

[17]Agribusiness Survey, Mumbai, Maharashtra, 2007.

[18]The legal perspective on contracts in these schemes is important to see why firms shy away from contracts. This is discussed in Narayanan (2009).

11.4.2 The Writing of Contracts

> *"When I use a word,"Humpty Dumpty said in rather a scornful tone,"it means just what I choose it to mean - neither more nor less."*
> *-Lewis Carroll, Alice in Wonderland, page 124.*[19]

> *This contract is so one-sided, I am astonished to find it written on both sides of the paper.*
> *- Lord Evershed, M.R. quoted in Robert E. Megarry,Discussing a standard form contract, page 276.*[20]

These two quotes sum up many written contracts between farmer and agribusiness in India. They are replete with ambiguity and are often one-sided.

One written contract carries a clause that reads: "This agreement is based on mutual trust and belief" (Singh and Asokan, 2005). Quality requirements are couched in similarly ambiguous terms in the contract - "contract produce at the time of delivery should be of satisfactory quality".[21] There are indeed cases where it is possible to define, precisely, parameters for judging what might be satisfactory.[22] Similar clarity is not offered for the color and appearance of chipping potatoes, for instance, which potentially leads to disputes with uncertain outcomes.[23] Likewise, it is hard to imagine that a firm's contractual commitment that it "shall provide high quality seeds and technical knowhow at reasonable prices" assigns clear, judicable responsibilities to the firm.[24]

Further, even if one were to assume that the contract document itself did not offer opportunities for interpretative haze, when contracts are written by one party in the form of take-it-or-leave-it contracts, the terms of the transaction are often explicitly (and expectedly) in favor of the firm. Singh and Asokan (2005) find that often, any loss or encumbrance not mentioned in the contract, contracts make growers liable to compensate the company. While a few allowed for compensation

[19]Carroll (1898).
[20]Megarry (1973/2006).
[21]Contract provided by agribusiness in Andhra Pradesh, April 2007. Contract details are proprietary, thus cannot be cited directly without the firm's permission.
[22]For example, in papaya contracts, firms use a device called the Brix meter to measure papain activity in latex in papaya contract farming by gauging the refraction and translucence of the latex which in turn indicates papain content, a minimum of which is required as per the contract. This device is easy to use and the farmers have an opportunity to measure it themselves.
[23]In the state of Jharkhand, when a multinational chipping company rejected payment to farmers for their small potatoes claiming that they couldn't process these, the farmers confronted the firm with chips packets, demonstrating that the firm was in fact processing even the smallest potatoes. Agribusiness Survey, Ranchi, Jharkhand, 2008.
[24]Contract provided by agribusiness in Karnataka, November 2007.

to the farmer in the event of the firm violating certain terms of the contract, in others, firms seek compensation for farmer's breach of contract, while remaining silent on the question of the firm reneging on its contractual obligations. Other aspects, for instance, involving termination of the contractual relationship, are also often one-sided. "The parties hereby agree that the lease shall be discontinued for genuine reasons which shall be decided by the first party (the firm)"(Singh and Asokan, 2005). Another contract states that at the time of delivery,"canneries have the discretion to increase/decrease the quantity of (contracted commodity) to be supplied".[25]

Should contract breach make it to courts, firms would run into another problem.The writing of contracts in India today involves no participation of the farmers. In most legal traditions, such non-involvement of farmers in drafting contracts to which they are party would make these contracts non-judicable. Acceptance, in judiciary terms, needs to be a 'valid acceptance'. As Sridevan (2006) elaborates, to be faithful to the Indian Contract Act, the relevant piece of legislation for agribusiness-farmer contracts, every clause in the agreement needs to be discussed, negotiated and then finalized, once there is consensus on each point. The contracts in use in contract farming schemes suggest otherwise. Indeed, farmers across schemes seek an opportunity to draft the agreement and "assist in the wording of specification in terms the farmer can understand" [26] and demand that the "management ensures that farmers know what they are signing"[27].

It is not clear that farmers understand the specific commitments implied by their signature. This is despite an explicit statement of acceptance of the terms laid out in the contract. The Farmer Survey reveals that while a number of farmers did understand the legality of the contract, a number of others were not sure what was meant by a contract document. They were not sure if the 'passbooks' they had were, in fact, contracts.[28] This is owing partly to farmers being unaccustomed to formal transactions, a related absence of understanding of the import of contracts, and partly due to illiteracy.

Interestingly, farmers often maintain a contract in someone else's name (usually a member of

[25]Contract provided by agribusiness in Punjab, March 2007.
[26]Interview with farmers, Coimbatore, 2008.
[27]Interview with farmers, Dindigul, 2008.
[28]In some schemes, firms hand passbooks to contracting farmers, in which transactions are recorded whenever there is transfer of inputs, credit or produce.

Table 11.1: Modes of Contracting and Farmer Awareness

Details	Average among all schemes(%)	Range across schemes (%)	Number of Respondents
Percentage of farmers who have a written agreement	54	18-90	438
- Percentage of these who have a copy	52	9-82	
- Percentage of these who have read it or had it read to them	44	22-67	
- Percentage of these who believe it is valid in court	49	0-58	
- Percentage of these who are unaware if it is valid in court	14	0-40	
- Percentage of these who think it is *not* valid in court	37	2-100	
Percentage of contract farmers who contracted as part of a group (See note 2)	44	14-95	158

[1] The data uses responses from Phase 1 and Phase 2 of Farmer Survey
[2] This figure for group contracting pertains to only the Phase 1 farmers in cotton and gherkins.
[3] All figures have been rounded off to the nearest whole number.

the farmer's family "who has brought luck in the past"). In some cases, these were toddlers, in others, deceased family members. The contract is then signed by yet another person (cousins, extended family and so forth), while the actual contractual obligations and cultivation are carried out by the farmer. In the Farmer Survey, several names on the contracting firms' roster of contract suppliers were of toddler-children of the farmers.

The Farmer Survey shows that only a half of all contract farmers who signed contracts kept a copy (Table 11.1), ranging from a tenth to four-fifths across the schemes.[29] Fewer still (44%) had read them or knew of its contents through other means. Importantly, a significant proportion (37%) who had signed contracts did not think it was valid in court. Less than half thought the contracts were legally valid, and 14% were not sure. This is true across schemes, although to varying degrees. It is interesting, for instance, that in the broiler subsector, only a small proportion stated that they had signed written contracts. Yet, almost all of them considered these valid in court. In contrast, in the papaya contracting scheme, while an overwhelming proportion had written contracts, almost all the contract farmers believed these had no legal validity.

In general, this absence of farmers' clear understanding of their legally binding contractual obligations raises interesting questions about whether the courts would in fact consider these

[29]It must be noted here that the Indian Contract Act deems oral contracts admissible in courts provided there is evidence of such a contract. In general, such proof is not available in the context of contract farming schemes in India.

contracts valid and uphold farmers' acceptance of their obligations. This contributes to uncertainty in judicial outcomes.

11.4.3 Costs of Enforcement

Even if it were possible to write out complete, verifiable contracts, farmers and agribusinesses in India encounter public institutions for enforcement that are expensive relative to the loss associated with the contractual dispute. The proverbially slow legal machinery in India, caused in part by a backlog of pending cases, almost guarantees long waiting times.[30] This prevents new cases from entering the court system without a very good incentive.

Given that firms transact with a large number of farmers for very small quantities, often the costs of legal action exceed any claim firms could realistically hope to recover. Further, most contractual disputes would be on a case-by-case basis. This implies that for the firm, every farmer taken to court, however small the transaction, entails a fixed cost.[31] As a procurement officer put it, "we had a big problem with enforcement, but it is simply not worth going to court."[32]

As an illustration, consider the data on defaults by farmers in a gherkins contract farming scheme in Tamil Nadu. Farmers are offered inputs on credit at the time of sowing, agreeing that when the contract produce is delivered to the firm, the amount owed against inputs is adjusted and the farmer is paid the net amount. For various reasons, such as yield risk and side-selling, the farmer often ends up delivering less than the expected commitment and hence becomes indebted to the firm. Firms are left with the choice of writing off the outstanding debts, carrying it over to the next season, or attempting recovery, either through private means or through courts. It is not unusual in contract farming schemes in India to have a very large number of defaulting farmers, each with a very small debt. In this example, 37% of contract farmers in the study area had some default (485 out of 1296 contracting farmers), but the average value of default was only Rs.3750

[30] As on October 31, 2001, 20.3 million cases were pending in the district and subordinate courts, 3.5 million in the High Courts and 21,995 in the Supreme Court (Parliamentary Standing Committee on Home Affairs, 2003). Normal adjournments in Delhi's courts, for example, are for 4-6 months, the trial dates are not available before 2 years and settlement of suit takes place over 15 years(Upadhyay, 2003).

[31] Procedurally, in most legal systems, even mass standardized contracts would not admit class libel and would have to be decided on a case-by-case basis (The Yale Law Journal Company Inc., 1949). This is necessarily the case, therefore, for individual contracts.

[32] Agribusiness Survey, Hubli, Karnataka 2008

(approximately US $78).[33] Figure 11.1 plots these defaults in decreasing order of magnitude. Given that the firm could potentially seek to recover these amounts from each defaulting farmer, this represents a *maximal marginal recovery curve*.[34] Superimposing a rough estimate [35] of the *marginal cost* of taking a farmer to court, it is clear that for a majority of the defaulters (and constituting a large proportion of actual procurement) the costs of recovery far exceeds the amount that can be recovered. From a purely economic perspective, the higher the costs of court-aided enforcement, the fewer the farmers the firm would go after; in particular, it only ever makes sense for them to attempt recovery from farmers located to the left of point E, the optimum, where the marginal returns to recovery effort and marginal cost that it entails are equal. At the higher end of the enforcement cost range, E' is the optimum, so that it makes sense to take even fewer farmers to court than at E. In this example, assuming an enforcement cost of Rs.5000/farmer, the firm could seek court enforcement for about 124 of them (approximately, 26% of all defaulting farmers), without incurring fiscal losses, assuming full recovery of outstanding dues. This figure drops as enforcement costs increase. At Rs. 12500/farmer, it would make sense for the firm to incur this enforcement cost for only 14 farmers (less than 3% of defaulters), again assuming complete recovery of dues.

Indeed, the gherkins firm in question asserted that legal recourse emerges as a less-preferred option given the relatively small recovery amounts per farmer and the large number of farmers who are culpable.[36] Firms express a willingness to "let it go" if the volumes or defaults are small and even larger amounts if they trust the farmer not to have diverted contracted output.

The farmers' enforcement options are far more limited, especially given that most contracts explicitly favor the firm; most often this involves opting out of contracting itself. Few ever go to court (about 1% of the respondents in the Farmer Survey), partly because for many farmers,

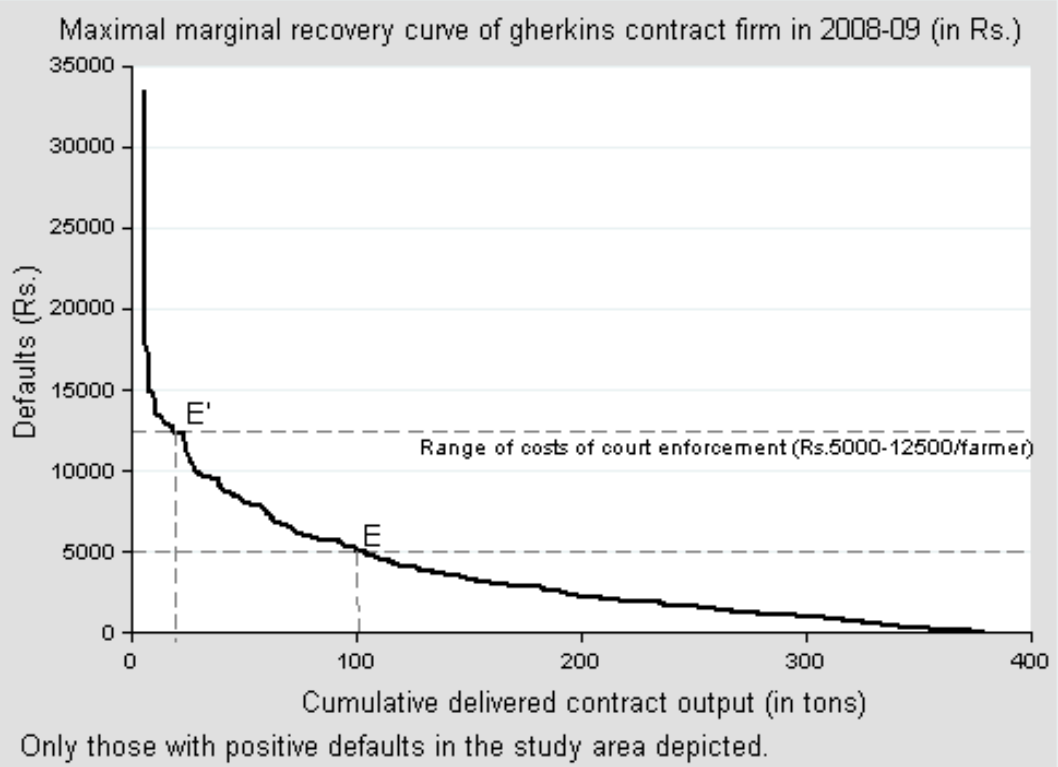
[33]This is equivalent to the retail value of eight, 12-oz. jars of gherkins pickles or around 220 kgs. of the highest grade of contract output, which is 0.05% of what was eventually procured that season in the study area.

[34]It is a "maximal" curve because, given uncertain judicial enforcement, this represents the best case, where the firm recovers all that is due to it by the farmer.

[35]This was collected from interviews with agribusinesses in Tamil Nadu, but is a crude ballpark figure.

[36]The firm may still choose to strategically enforce contracts to induce future compliance. This is taken up in Section 11.4.4.

Figure 11.1: Farmer Defaults in Gherkins, 2008-09



recourse to legal redress is practically out of reach, if not in terms of monetary costs, in terms of other barriers such as legal literacy, demands on time and access to legal assistance.

11.4.4 The Idea of a Contract: Private Ordering in the Shadow of the Law

Given that both enforceability and enforcement are problems in equal measure, what is the role of the contract itself in these contract farming schemes? Is it conceivable that if enforcement were not a constraint, firms would treat contracts as legally binding instruments, preferring these to informal arrangements? Interviews with agribusiness indicate that such a scenario is unlikely.

First, the very fact that a contract tries to be specific and rigid in defining contingent claims is, in the firms' view, a disadvantage, since the firms lose 'flexibility'(Klein, 1996). Gow et al. (2000) observe in the context of Slovak sugar industry that firms often value the flexibility that comes with informal arrangements. In India, for instance, the year 2008-09 saw gherkins processors lose international orders on account of the global economic slowdown; many firms had contracted far

more than they wanted. At times like this, an executive explained,"we would like the farmers to cheat and side-sell to other companies. That would actually be a great help! But the contract obliges us to buy what they produce, even though we have no orders".[37]

Importantly, the social context these firms operate in influences agribusiness attitudes to the contract as a legal instrument. The very idea of a contract carries little meaning when few farmers understand the document they are supposed to sign. In fact, in some parts of India, fly-by-night operators have duped farmers of their lands, while the farmers had no idea that they had signed away their land as collateral. Several such cases have been reported in the state of Orissa in recent years.[38] In much of rural India, the idea of committing to anything in writing is often disconcerting to the farmer. "If you go to a farmer with a pen and a document, you can be sure he will run away", said a field official , explaining how the company first establishes contact before explaining the procurement arrangement to the farmer.[39] This can often be a long process and some farmers take years before accepting to grow produce for the company. Firms thus tend to believe that for contract farming relationships, "trust is a precondition, whereas a contract is not, absolutely not."[40] This sentiment is pervasive. Said one executive: "what is the use of contract? You can't do anything with it anyway. Trust is a hundred times more valuable than a contract".[41,42]

The firms typically claim that they are unlikely to ever take legal action for breach of contract. One firm's executive pointed out that it was a very sensitive issue, politically. "In our country, we can't go after the farmers, it is not even right to go after them in case of breach - you can't fight the *annadatas*".[43]

Another agribusiness executive explained that "even if contracts were easily enforceable in courts, that is not the way you work with farmers. You need to establish a relationship with

[37] Agribusiness Survey, Dindigul, Tamil Nadu, 2009.
[38] Personal communication with Action Aid (India), Bhubaneshwar, Orissa, March 2007.
[39] Agribusiness Survey, Secunderabad, Andhra Pradesh, 2009
[40] Agribusiness Survey, Hyderabad, Andhra Pradesh, 2009.
[41] Agribusiness Survey, Coimbatore, Tamil Nadu, 2008.
[42] While it is conceivable that that exogenous change in education, literacy and awareness would assist transition to contract-based relationships, it is unlikely that court-aided enforcement would ever render trust irrelevant, as has been pointed out repeatedly even in developed countries (Macaulay (1963), for instance).
[43] Agribusiness Survey, Mumbai, Maharashtra, 2007. The term *annadatas* means 'givers of food' and carries the connotation of a noble profession.

them. The loss from breach is easily made up; a relationship that is strained is not!"[44] Another executive said, "governments don't understand these things. You can't force farmers to enter into paper contracts with some third party settling disputes.That would make it impossible for us to work with them."[45] In the case of Maharashtra, while the stated reason for the poor response of agribusinesses was that these laws were not sufficiently well-publicized, industry sources felt that both firms and farmers preferred "informal arrangements based on trust, experience and market dynamics instead of having a formal arrangement"(Ghadyalpatil, 2008).

Indian agribusinesses typically articulate a concern that the motivation crowding out effect or substitution effect might outweigh the complementarity effects of formal mechanisms, that formal agreements might undermine voluntary compliance and hence the self-enforcing nature of arrangements. Firms appear to factor in the substitution effect seriously in their contracting decisions, ensuring, even in the context of formal written contracts, that the highly personal and customized nature of engagement is not undermined. This is sometimes evident in the contract document itself. For example, one of them reads: "In case of any dispute with regard to the lease between the parties, the same shall be settled by mutual discussion" or, as another puts it, disputes will be "endeavored to be solved through dialogue".[46]

The Farmer Survey reveals that private order enforcement dominates overwhelmingly as the means through which transactions are maintained, with law playing only a peripheral role, if at all (Table 11.2). Only 6% of those interviewed as part of the Farmer Survey thought the firm would take them to court, if the farmer breached the contract. More than a fifth of the farmers felt that the firm would attempt to recover outstanding amounts privately, through field officers, by complaining to village leaders and local representatives and so forth.

Firms often rely on repeated interaction over the long term to discourage farmers from breaching contracts. "We are so big, that none of them can afford to burn bridges. At some point of time if not now, at some time in the future, they have to sell to us. No one can hope to avoid us completely all the time, so this helps and encourages them to keep up their commitment."[47] Across schemes,

[44] Agribusiness Survey, Hyderabad, Andhra Pradesh, 2007.
[45] Agribusiness Survey, Coimbatore, Tamil Nadu, 2008.
[46] Contracts provided by firms in Tamil Nadu and Andhra Pradesh, 2008.
[47] Agribusiness Survey, Kangeyam, Tamil Nadu, 2007.

Table 11.2: Farmer Perceptions of Enforcement in Select Schemes

What would the firm do if you breached the contract?	**%**
Stop contracting, deny advances or credit	35
Attempt recovery through appropriate action, not pay us	21
Warn us or do nothing	15
Go to court	6
Others	14
No response	9
What would you do if the company breaches the contract?	**%**
Stop contracting, and/or switch firms	36
Give up the contract crop altogether	13
Nothing, we are powerless	32
Make a representation to the firm,complain to other authorities, demand compensation	17
Go to court	1
Others	1
Total number of respondents	**484**

[1] The data uses responses from Phase 1 and Phase 2 of Farmer Survey
[2] All figures have been rounded off to the nearest whole number.

farmers seem to know this. A majority of 35% of the respondents in the Farmer Survey said the firm would stop contracting with them in the future if the farmer breached the contract in some way.

In some cases, it is a form of collective punishment. "As a rule, we always tell the farmers, if any of you cheat we will boycott the village and even the good ones will lose out. This works a bit, but there are always a few who cheat."[48] In still other cases, reputation plays a big role. The gherkins cluster in Karnataka and the poultry cluster around Coimbatore in Tamil Nadu have developed a system where they inform one another of 'blacklisted' farmers. While the gherkins firm felt it was beginning to work, the poultry firms were still refining the system. In the initial phase, they did not anticipate that farmers would approach other companies through other family members and sometimes alter the name of the farm to escape recognition. The firms were now working to identify farmers by the survey number of the plot they owned.[49]

As Galanter (1981) points out, the plurality of enforcement mechanisms available implies that as

[48] Agribusiness Survey, Hyderabad, Andhra Pradesh, 2008.

[49] Another relatively recent development is a whole class of contracting intermediaries who have emerged as aggregators of contract produce for the firm. This is particularly true for firms that operate on a large scale. They are involved in selecting and maintaining farmer relationships on a commission basis, not unlike traders in traditional market channels. This appears to be the firms' response to get the incentive-moral hazard problem right, and from the perspective of this work, it outsources enforcement, in some sense. This is discussed further in Narayanan (2010b).

the parties come to terms with the intrinsic limits of court ordering, they craft their own transaction-specific contractual supports that involve private ordering. As agents recognize that their purposes are served by continuity and cooperation, the concept of contract as legal rules gives way to the more flexible concept of contract as framework, or a focal point. A contract is then incomplete and "almost never accurately indicates real working relations, but affords a rough indication around which such relations vary, an occasional guide in cases of doubt, and a norm of ultimate appeal when such relations cease in fact to work" (Galanter, 1981; Llewellyn, 1931). The contract document is then something of a "social artefact" or a "social representation of a relationship"(Suchman, 2003).

In the Indian setting, the contract is, at best, a tool to declare seriousness of intent or to initiate a process of discussion with the farmer for better clarity of the terms of the transaction. Thus, even if the contract is rarely (meant to be) enforced, contract agreements help to spell out clearly the rules of a relationship (McMillan and Woodruff, 1999). One representative of a firm that contracted for gherkins stated that even though the chances of litigation were minimal, they were investing a lot of effort in making the contracts tighter and more specific so that the farmer understands the parameters of engagement well. Another agribusiness representative stated, "We have written contracts but they are of no use. They are not legal binding; but they *are* moral binding. Every year about 5-8% of the contract farmers deceive us, but others have integrity."[50]

At other times, rather than serving as a mechanism to ensure that farmers honor their commitment, the contract is a defense mechanism for the firms so that should the farmer approach the courts they have adequate protection. This explains, in part, why contracts are one-sided. A procurement manager explained, "Sometimes the farmer can also be unreasonable. We once had a notice from a lawyer suing us for Rs.4 lakhs (approximately US$ 8500). The farmer blamed us for his low yields. We countered it by saying that he had not really followed the practices and the contract clearly states that the farmer is expected to follow the recommendation. His fields were waterlogged and we had already advised him. The court saw the point."[51]

When viewed in these terms, it is possible to read the terms of the contract differently.

[50] Agribusiness Survey, Belgaum, Karnataka, November 2008.
[51] Agribusiness Survey Hubli, Karnataka, November 2008.

What seems like ambiguity from a legalistic perspective is now consistent with the purpose of the document, that is, when there is such a thing as a document.

On those rare occasions when the firm does sue the farmer for breach in contract, a very different logic is at work. For instance, in 2007, a contract supplier for a broiler firm sold the entire stock of over 6000 birds to a wholesaler even though the contract expressly forbade this. The broiler firm decided to take him to court. There were other things the firm could have done, a multilateral strategy, for instance, where all broiler firms would boycott the farmer.[52] However, such a coordination mechanism had run into difficulties since they were unable to establish the identity of defaulting farmers with certainty.[53] Further, the wholesalers, the alternate market channel, were outside their network, so the penalty for the farmer would not be effective. The case had been going on for two years and an executive confessed that they had spent far more money than the loss they incurred. "But", he said, "we feel that this sets an example. We show other contract suppliers that we will not take it lying down. From that perspective, we think, rather, we hope that it is worth it."[54] There are similar cases where the firm has successfully sued intermediaries who sub-contract with farmers. Their experience has been that this reduces the chances of cheating.[55]

This can work both ways, though. One executive confessed "we would never take a farmer to court; it would jeopardize relations with all the farmers and not just the one who defaulted".[56] There is a pervasive sense among contracting firms that suing a farmer would effectively scare away or lose them all their contract farmers the following season.

Here, we see evidence that third party public enforcement mechanism goes beyond a backstop and is quite differently embedded in a set of multiple enforcement mechanisms. Legal recourse is not the last resort. Rather, it becomes an instrument of information transmission and conveys a set of incentives through a demonstration effect but at the same time, could potentially transmit disincentives as well. Firms need to factor in this tradeoff between the complementary and

[52] In the broiler industry in Tamil Nadu contracting firms tend not to cross-purchase, so that the side-selling usually occurs with wholesalers in the open market.

[53] This is because the farmers often used names of firms for their farms while signing the contract, changing these if they did default. So too with individuals, who typically signed contracts in the name of different members of the family each time they signed a new contract.

[54] Agribusiness Survey Coimbatore, Tamil Nadu, 2009.

[55] Agribusiness Survey Dindigul and Nilakkottai, Tamil Nadu, 2007.

[56] Agribusiness Survey, Mettupalayam, Tamil Nadu, 2007.

substitution effects of formal contracts and their enforcement in their procurement and enforcement decisions.

11.5 The Moral Economy of the Contract

It is evident from the above that farm-firm contractual relationships in India are viewed in very broad terms. This is indeed relationship farming more than contract farming. An agribusiness executive likened the firm-farmer link to a marriage,"you have to work at it until you die, there may be lots of ups and downs, but you have to stick with it."[57]

There is ample evidence in India of what scholars have noted to be true of contract farming schemes in other developing countries, that there exists a "moral economy" of the contract (Clapp, 1994). This moral economy of the contract offers a space wherein firms reward the "ostensible observance" of the salient terms of the contract by farmers by overlooking minor transgressions (Clapp, 1994; Scott, 1976). The firm-farmer relationship occupies a space larger than that defined by the contract; even as everything in these "contracts is not contractual"(Durkheim and Bellah, 1973), extra-contractual interactions between the firm and farmer influences contract performance, for instance, by altering the incentives for compliance.

For instance, many field officials working to monitor crops and offer technical advice to the farmer often end up helping the farmer with other crops as well, teaching them about pesticide use for non-contract crops, crop planning and so forth (Table 11.3). Nearly, a fifth of all respondents in the Farmer Survey had sought advice from the field staff of the contract firm for crops other than the contract crop. The nature of inputs sought range from specific actions to tackle problems with specific crops to a much broader engagement seeking general advice on new technologies, crops and markets, cultivation practices and so on. Some firms employ workers from farming families, many of whom are contract suppliers. While the Farmer Survey does not provide cases of this, it is apparent that the firm-farm relationship for those families who transact with the firm for both wage employment and supplier of produce, could enhance the durability of the relationship.[58] The Agribusiness Survey reveals too that several firms directed Corporate Social Responsibility

[57] Agribusiness Survey, Hyderabad/Ranchi, 2008.

[58] This parallels the contract interlinkage literature, e.g., Braverman and Stiglitz (1982).

Table 11.3: Kinds of Breach and the Moral Economy of Contract Farmers

Details	**Average percentage across all schemes (%)**	**Range in the different schemes (%)**	**Number of respondents**
Percentage			
- who diverted contract inputs for non-contract crops	17	0-26	481
-who engaged in side-selling the previous season (self-reported)	17	2-64	484
- of other farmers in the village who engaged in side-selling the previous season	12	0-26	484
-who received advice for other crops from the field official	19	0-43	475
Percentage unable to deliver on the contract at least once in the past	44	0-88	484
The reason for this, in the last such instance:			
- Weather or yield loss	52	35-65	
- Urgent need for cash	15	10-25	
- Market or competitor price was higher	10	6-22	
- Firm delayed or did not show up	5	0-18	
- Produce fell short of quality standards	5	5-19	
- Personal reasons (e.g., death in the family)	13	9-19	
Percentage who felt the firm had *not* honored the contract in the last season	10	0-23	438
Percentage reporting rejection of some contracted produce	45	9-97	475
Ratio of days until full repayment under contract (relative to alternate market)	7*	1-27	381

[1] Data pertains to Farmer Survey, Phases 1 and 2
[2] Figures have been rounded off to the nearest whole number
[3] The total number of respondents varies depending on the category of farmers who were asked the question. Some questions were addressed only to currently contracting farmers, others were addressed to both current and former contract farmers, and so on.
[4] * This figure is a pure number, not a percentage.

activities to contract villages, including donations to schools, village festivals, conducting medical camps, etc. Larger agribusinesses leverage goodwill created over the years through their community engagement to put contract farming arrangements in place.[59]

Such non-contractual actions influence tacitly, and positively, the contractual performance of farmers. Often there is ex-post-forgiveness of deviations from the contract and a large class of actions is pardoned as "excusable breach" (Fafchamps, 2004). In general, the moral economy of a contract implies explicit recognition of "excusable breach" on account of reasons the field agents deem as being beyond the farmers' control or too minor to merit enforcement(Fafchamps, 2004).

Often, breach is not literal or obvious. There are many elements to a contract and even when

[59]These firms, especially, see the grafting of formal contracts onto their preexisting relationships as detrimental to the trust that has been built over the years, undermining farmer-firm relationships.

there is not an obvious violation of the salient terms of contract (i.e., delivering the produce of a given quality at a particular time and place) the terms of engagement can be subverted by farmers in many ways.

For instance, several contract farmers are known to the firm to use contract inputs for non-contract crops (called 'input diversion'). According to the Farmer Survey, 17% of the farmers admitted to input diversion in the most recent contracting season. Often, contracts oblige farmers to follow recommended cultivation practices. Many do not. "Our procurement takes place from 25,000 farmers, of whom about 65% really follow all the technical information we provide".[60] In other cases, it can get more innovative. Some marigold contract farmers soak the flowers before they deliver to the company so that they weigh more. Sometime papaya latex is adulterated with flour, sometime with water. "One season, they got our laborers to adult our latex with water. But for the farmers, we are their *adaikalam* or refuge. They went astray but all of them have come back to the fold."[61]

The more blatant kind of contract breach by farmers is side-selling. It is common for firms to contract acreage, obliging the farmer to sell all the crop harvested from the contracted acreage to the firm. Sometimes, farmers divert contract produce to other buyers who pay more at the time of harvest. In the Farmer Survey, 17% of the farmers admitted to have sold at least some part of the contracted produce to buyers other than the contract firm during the most recent season they contracted (Table 11.3). Despite side-selling being a clear breach of contract, it is sometimes on account of personal exigencies. Firms recognize this, often saying, "we don't penalize the farmers for doing that. They are not entirely to blame. Sometime they need cash urgently, so they sell to someone else."[62]

Indeed, the Farmer Survey suggests that in general, about 44% of the farmers have been unable to deliver the contracted produce as promised at least once in past (Table 11.3). More than half the farmers who admitted this was the case attributed their violation to crop loss due to pests or the weather. Close to 15% of them said they sidesold only because they were in urgent need of

[60] Agribusiness Survey, UgarKhurd, Karnataka, November 2008.
[61] Agribusiness Survey, Oddanachatram, Tamil Nadu, 2007.
[62] Agribusiness Survey, Karamadai, Tamil Nadu, 2007.

cash. Another 13% were unable to deliver owing to personal reasons, like a death in the family or illness. These were typically overlooked by the firm as excusable breach. One executive, like his counterparts elsewhere, put things in perspective "We found that whereas the loyalty was 92% in 1995, it has now dropped to 82% thanks to the other plants encroaching. Farmers sell to them because of many reasons. Sometimes, they are in need of cash. At other times, they want to sell (and harvest) earlier than we recommend so that they can accommodate another crop. Also, there are some mills that outprice us after we announce our price. But, we have been here about 60 years and we are the largest, so we are not under major threat. In our company, loyalty of farmers is high."[63]

Only when the transgression exceeds limits does the firm actively seek to enforce, by whatever means they deem appropriate. Many firms that are committed to maintaining trust often take huge losses."We succeeded in contract farming because we did not reject or refuse to accept produce, once we had got what we want. We used to take it even if we did not want it."[64] Another procurement officer said that there were seasons when they weighed the produce, paid the farmers and emptied it into the mud to discard. In one scheme for medicinal herbs, operating in Karnataka, the firm specifies in the contract that should the firm fail to take delivery of contract produce, it would cover the expense and arrangements to sell in the open market.

From the farmer's perspective, knowing that this moral economy offers space for minor transgressions prompts them to maintain the system. They offer similar room for the firm's transgressions and address these by raising the relevant concerns with the firm's officials or field agents. In the Farmer Survey, 17% of the farmers said they would approach the firm if they found that the company had breached the contract.

About 10% of the farmers in the Farmer Survey felt that the contracting firm had not honored the contract in some way in the most recent contracting experience (Table 11.3).[65] The firms' breach of contract can be just as varied as the farmers'. It is not confined to a refusal to show up to buy the contracted produce and is often more insidious. Firms could instead establish non-transparent

[63]Agribusiness Survey, Dharwad-Belgaum, Karnataka, 2008

[64]Agribusiness Survey, Coimbatore, Tamil Nadu, 2007.

[65]This is likely an underestimate, since in some survey villages farmers were reluctant to discuss this issue, fearing that doing so would jeopordize their relationship with the firm.

quality standards, reject produce arbitrarily and alter prices when the produce is delivered. It could even offer harmful technical advice. A few farmers in the Farmer Survey mentioned that firms recommended chemicals that kill the standing crop if they have obtained sufficient supplies. Farmers stated that this often depended on the field officer and a few of them mentioned this had happened in the most recent contracting season. There could be other issues as well, as a particular NGO employee, who was mediating the firm-farm relationship, explained "Our agreement was that seeds would be delivered on such-and-such date and harvest and delivery at the factory gate would happen at a certain date. In practice, the delivery of seed takes a time-span. It is sent in lorry loads and there is almost two weeks separating the arrival of the first consignment and the last consignment. So the farmers who sow last, nevertheless have to harvest the potato on the given date, so these potatoes all tended to be under-sized; they were harvested prematurely. These are rejected. So the firm actually controls the supply by regulating timing of seed delivery".[66] In broiler contract farming, the firm's need to have control over total market supply to influence prices implies that they often contract for fewer growing cycles per year than they originally promise the farmers. The Farmer Survey reveals for instance, that in 2009, while contract growers were promised six batches that year, 43% of the growers were offered only five batches, 48% were offered four, and the rest had to settle for three of fewer batches that year. Other ways in which the firm dilutes its commitment include delayed payments for contracted produce, or late lifting or evacuation of contracted produce (which results in higher rejection rates or sub-optimal weights).

But, as with firm response to farmer breach, it is only when the firm's breach inflicts a cost beyond what is perceived to be reasonable to the farmer, that the supplier revisits his/her decision to contract. In general, farmers are in a weaker position, relative to the firm, unless there is a viable alternate market and one where collusion among buyers is not possible. Close to a third of farmers say that they are powerless to do anything in the event of the company breaching the terms of the contract. Again, this goes back to the way contracts tend to be written. Close to half would stop contracting with the firm, switch firms or give up the contract crop altogether (Table 11.2). A few farmers also stated that they would not let the concerned firm step into the village again if

[66] Agribusiness Survey, Ranchi, Jharkhand, 2008.

they violated their terms of the contract. The Farmer Survey suggests too, that in the event of the company breach only 1% of the farmers would attempt to go to court.

Given the contract farmer's weak position in a contractual arrangement, the ability to side-sell, to stop contracting or to switch firms is what gives farmers agency and depending on the particular market structure for the contract commodity, can redress, partly, imbalance in the contractual relationship.[67] The exit of farmers itself offers a signal to the more responsive firms, who then have an opportunity to assess their own contractual performance and make necessary adjustments in order to survive. This is particularly the case when there are competing firms that offer contracts to attritioning farmers.[68] Interviews with businesses that have survived suggest that most respond with new arrangements that work on the participation constraint of the farmer, where a contracting firm has to make offers at least as attractive to the farmer as the next best option available. In 2007-08, there were so many firms contracting gherkins in the study area that firms had begun to offer cash gifts and vacation packages to the farmers to induce them to contract.

In general, the centrality of personal relationships in contract farming systems in India is manifest in the way firms identify and conduct business with farmers. The process of identifying farmers with whom to contract differs substantially across schemes. For both papaya and poultry, the identification of farmers is primarily through social networks and contacts; 57% of papaya contract farmers and 95% of broiler growers entered into contracts based on preexisting social relationships with the firm's employees. For marigold and gherkins, the firms tend to identify a small region and then canvass in the villages within that region for farmers who might be willing to contract. Only 8% of all gherkins contract farmers and about 12% of marigold contract farmers were selected based on social networks. Once the contracting arrangement is in place, field officers of all the firms in the survey interact closely with the farmers in a highly personalized way, partly owing to the need for oversight of the production process. In the case of broilers, field officials visited the farmer everyday, for gherkins and marigold this was three to four times a fortnight. For

[67] Swinnen (2007), for instance, discuss the effects of competition on rent distribution and the welfare implications for farmers.

[68] This is reminiscent of Hirschman (1970)'s thesis on exit, voice and loyalty, which suggests that the firm's ability to respond to exit and voice would contribute to maintaining the system. In another sense, this also bears out the view that competition among contracts leads to convergence in forms(Eggertson, 1990). In most commodities, competing firms end up offering remarkably similar terms of contract, at least on paper.

papaya at the nursery stage, field officers visit contracting farmers daily, tapering off their visits once the tree attains maturity.

The primacy of trust and relationship both enables informality in contracting and is also a result of the absence of legally valid written contracts. It is common in the contract farming literature to see a scheme described in categorical terms as being formal (written contracts) or informal (oral agreements) or as contracting with groups or individuals. In contrast, the Farmer and Agribusiness Surveys suggest that firms engage with farmers in different ways depending on what works for each farmer, so that even within the same scheme there is a mix of formal and informal, of oral and written contracts, of group contracting and individual contracting, etc., although the major terms of the contract might be shared. It is 'contact' that enables field officials to determine where an oral contract would work better than a written contract or where it is appropriate for farmers to contract as groups rather than as individuals.[69]

11.6 Contractual Commitment and Performance: Examining Breach and the Self-Enforcing Range of Agreements

One way of examining, empirically, the primacy of relationship is to identify the "self-enforcing range" (Klein, 1996) of contracts in contract farming schemes(Gow and Swinnen, 2001). If, as earlier sections suggest, farmers and firms view contracts at a particular time period as part of a broader and longer term relationship, one would expect contracting farmers and the firm to desist from myopic opportunistic behavior.

As far as the farmers are concerned, those who value the contractual relationship beyond the present might be willing to sell on contract even if the alternate or market price were to fall below the contract price. Farmer 'loyalty' to the firm could manifest as inertia in sideselling response to differentials between spot market price and contract price in the delivery period, at least up to a threshold, beyond which the farmer would breach the contract and side-sell.[70]

[69]This paper focuses purely on the firm's field officers functioning at the firm-farm interface or as 'boundary' persons. When firms expand and scale up, several re-intermediate, using agents on a commission basis to mediate these relationships with farmers. This raises a set of interesting questions on its own and is explored elsewhere.(Narayanan, 2010b)

[70]In Klein (1996)'s formulation, a similar threshold from the firm defines the other end of the self-enforcing range. This is not considered in this paper. The analytical model underlying this approach is detailed in Chapter 4.

Previous sections described in detail the importance of personal relationship in maintaining transactional relationships, mainly from the perspective of the firm. The Farmer Survey offers an opportunity to examine this from the farmers' perspective, and to see specifically if the empirical evidence from the survey corroborates the importance of relationships for contractual compliance. The remainder of the chapter maps these threshold price differentials and their correlates and also analyzes self-reported side-selling behavior to identify its correlates. The first is equivalent to mapping contractual commitments onto expected price differentials, the latter is equivalent to assessing contractual performance in relation to actual price differentials. Throughout the section, the goal is to distinguish explicitly between two opposing forces, a negative price differential that provides incentives for breach and ties that bind the farmer to the firm and hence act as restraints to breach. In other words, do "relationships" really matter? If yes, how much do they matter in terms of unit price foregone and to what extent can they improve contractual performance, or neutralize price-driven incentives to breach?

11.6.1 Threshold price differentials

Defining normalized price differential D_{it} as

$$D_{it} = \frac{P_{ct} - P_{mt}}{P_{mt}} \times 100 \tag{11.1}$$

where, P_{ct} refers to the contract price for delivery at time t, and P_{mt} refers to the spot market (or alternate/alternative) price at the same time, this marks a range of possible price differentials at the settlement time. Throughout this section, D_{it} serves to represent price-driven incentives that influence (1) contractual performance (whether a farmer chooses to honor a contract or not) and (2) contractual commitment (whether a farmer accepts a contract or not).

I now define $\bar{D}_i$ as the normalized *threshold* price differential. This is best characterized as the minimum difference between contract price and the spot market or alternative price, represented by a farmer's expectation at the time of contracting of the spot market price at delivery and

settlement time, that the farmer would be willing to tolerate in accepting a contract.[71] These threshold differentials, $\bar{D}_i$ are farmer-specific, but are assumed, for the present analysis, to be stable over time. This is given by

$$\bar{D}_i = \left[\frac{P_{ct} - E(P_{mt})}{E(P_{mt})} \right]_i \times 100 \tag{11.2}$$

At any time t, whenever $D_i \geq \bar{D}_i$, the farmer will be willing to accept the contract and if it were the case that $\bar{D}_{it} < \bar{D}_i$ the farmer would decline the contract. So, the threshold defines the price differential tolerance of a farmer and the range of price differentials over which the farmer accepts contracts. It is easy to see that when $\bar{D}_i \geq 0$, the farmer demands a contract price that offers a premium over the expected alternative price and for $\bar{D}_i < 0$, the farmer will tolerate a contract price that sinks below the expected competing price. Drawing on Minten et al. (2009), the Farmer Survey elicits these thresholds, for pre-specified levels of $E(P_{mt})$.[72] The normalization with respect to $E(P_{mt})$ enables comparison across commodities.

Figure 11.2 and show the cumulative distribution of price differential thresholds for contract

[71] In examining the threshold for contract acceptance, I focus on the price differential per unit of contracted produce for a given volume of contracted produce.

[72] First, farmers were asked if, in general, they would accept to abide by the contract if the contract price were lower than the market price, i.e. whether their $\bar{D}_i < 0$. Farmers who answered in the affirmative were then asked how much lower the contract price could be relative to the market price. Farmers who declared that they would not abide by the contract if the contract price were lower than the market price were asked how much higher the contract price would have to be over the market price before they were willing to go with the contract. In essence, these farmers indicate that the contract price would necessarily have to match market price. The followup questions are to ascertain if it is a sufficient condition or whether firms would have to offer a premium over the market price. Farmers were asked to state these with respect to a notional average farmgate price for the contract commodities the past year, according to industry sources. This was Rs.6/kg. for marigold, Rs. 40/kg. for broiler. They were further asked to state the threshold differential for a representative 'high' (Rs. 10/kg. for marigold and Rs. 60/kg. for broiler) and 'low price' (Rs.2/kg. and Rs.20/kg. for marigold and broiler, respectively). These figures were based on estimates offered by traders, industry sources and farmers, as 'typical' low and high prices. Thresholds were elicited for these three reference market prices to take into account that the price differential that induces farmers to side-sell might vary over the range of prices prevailing for the particular commodity. Unless otherwise mentioned, the analysis is with reference to the 'average' alternate price. For gherkins, which has no alternate domestic market, the average reference price used is the competitor's price for the smallest size gherkins (Grade I), which forms the bulk of production and carries the highest rate per kilogram.

farmers for gherkin, broiler and marigold. [73] The Y-axis is the proportion who will accept a contract at that price differential.

These thresholds differ widely across the three contract commodities. For gherkins, few farmers (3%) are willing to accept a contract which offers a price less than the next best alternative. For marigold, at the other end, most farmers (76%) would accept a contract price that is below the market price. Broiler presents an intermediate case, where 62% of the contract farmers would accept a contract that offers a price lower than the alternative market price.

While negative threshold price differentials can be interpreted as reflecting farmer loyalty to the firm or a farmer's value of his/her relationship with the firm, it is important to recognize that there are several competing factors that explain these threshold differentials. Broadly, the farmers' willingness to accept a lower contract price relative to the alternative is related to the ability of farmers to access an alternate market for the contract commodity. This can be physical access that pushes up the transactions cost of spot market participation or it can be the particular market structure of a commodity or issues of social access due to caste, ethnicity, gender and so on. When the contract farmer has few options outside the contract so that the farmer's expectation spot market price, i.e., $E(P_{mt})$, is very low, it is conceivable that the firm can drive down the contract price close to the farmer's threshold $\bar{D}_i$.

In the case of gherkins, although the absence of a local market for a highly perishable commodity puts pressure on farmers to accept a low price, the presence of multiple firms who compete for suppliers and supplier loyalty implies that the farmers are less willing to accept a contract that offers a price lower than the competitor's offer. In order to keep contracting farmers in the fold, a firm has to match the competitor's price.

The broiler market represents an intermediate case, being segmented between a large section of highly organized broiler firms, that are close to being vertically integrated, and contract with growers and small traditional open market chain dominated by wholesalers dealing in backyard poultry.

[73] Papaya has been excluded from analysis since there was no meaningful alternate spot market or competitor price in the region. Also, at the time of the survey, several papaya contract farmers had lost most of their crop to mealybug, and farmers were reluctant to answer questions pertaining to their contractual commitments and to firm-farmer relationships.

The case of marigold is more complex and deserves special attention. At the time of the survey, there was only one firm contracting for marigold in the study area. A thriving spot market for flowers, however, provides huge incentives for breach. Marigold is a differentiated commodity in this setting. For the firm, it is a low value input; flowers are crushed to extract a high-value product, i.e., oleoresin. In contrast, the open market highly values fresh flowers sold for decorative purposes. Yet, even while the incentive for breach is high, the open market prices are highly volatile with the high P_{mt} concentrated around a handful of festival days. It is also a discerning market which selects only big and fresh flowers. In contrast, the firm offers a fixed price through the season (six pickings, typically), is far less sensitive to quality and accepts very dry and small flowers too. For the farmers, therefore, this is a valuable relationship to maintain. This is manifest in a large proportion having very low (negative) thresholds, despite high incentives for breach. In general, as mentioned in Chapter 8, many marigold farmers contract cannily, expecting to divert some of the contracted volumes to the spot market when prices shoot up. The figure presented here could reflect not this aspect. It could also reflect an aggregation bias since over the season the market price is highly variable, and the elicitation of the threshold price differential does not disaggregate particular time periods within the season.

Figure 11.4 maps the actual price differential the last time contract farmers delivered on their contract .For gherkins, the price differential is tightly clustered around zero, indicating competition between procuring firms (Table 11.4).[74] Broiler has a distribution centered around zero, with a greater spread than for gherkins, reflecting the more mixed structure of the market.

The product differentiation in marigold between a high-value spot market and a low-value contract commodity shows up strongly, as the contract price is lower than the market price by around 80%(Table 11.4). This could be in part because the market price itself is endogenously determined since the market supply of fresh flowers is reduced by contract sales.

While the alternatives the farmer faces influence thresholds, another important driver is attitudes towards risk and ambiguity. If, as is widely believed, contracting offers some certainty of market access or price stability in a way that the alternative does not, then one would expect

[74]This is related somewhat to Eggertson (1990)'s observation that over time, competition among contracts can lead to convergence in the terms of the contract.

Figure 11.2: Broiler and Gherkin: Threshold Price Differential and Contract Breach, 2009-10

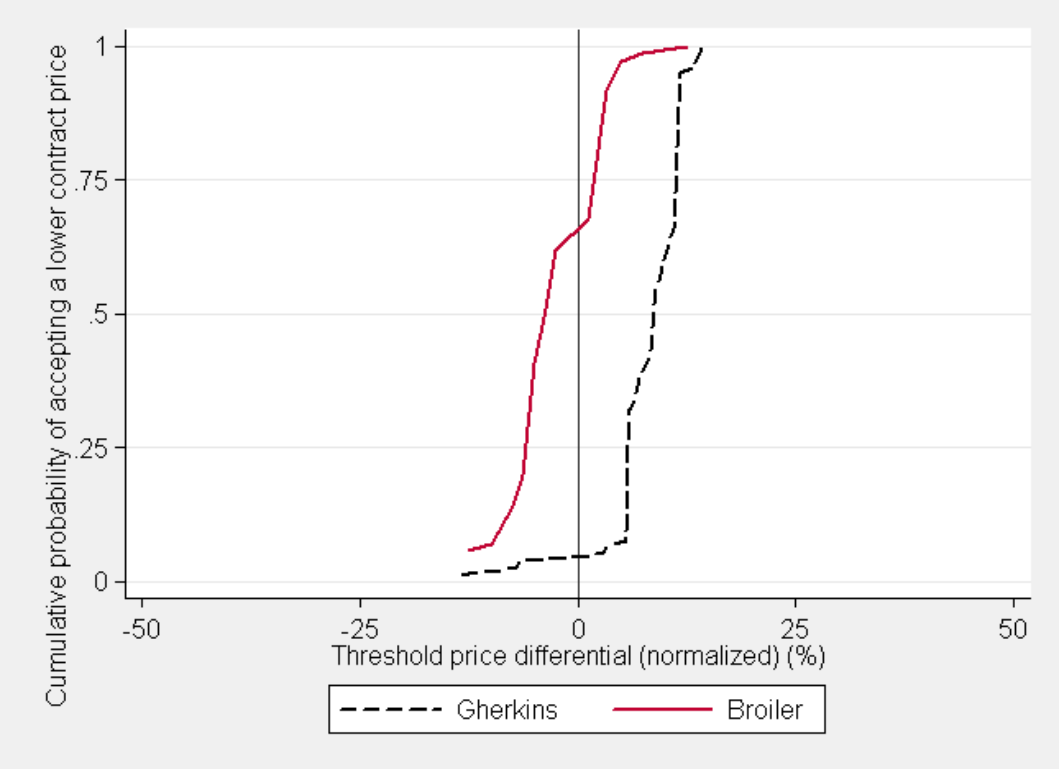


Figure 11.3: Marigold: Threshold Price Differential and Contract Breach, 2009-10

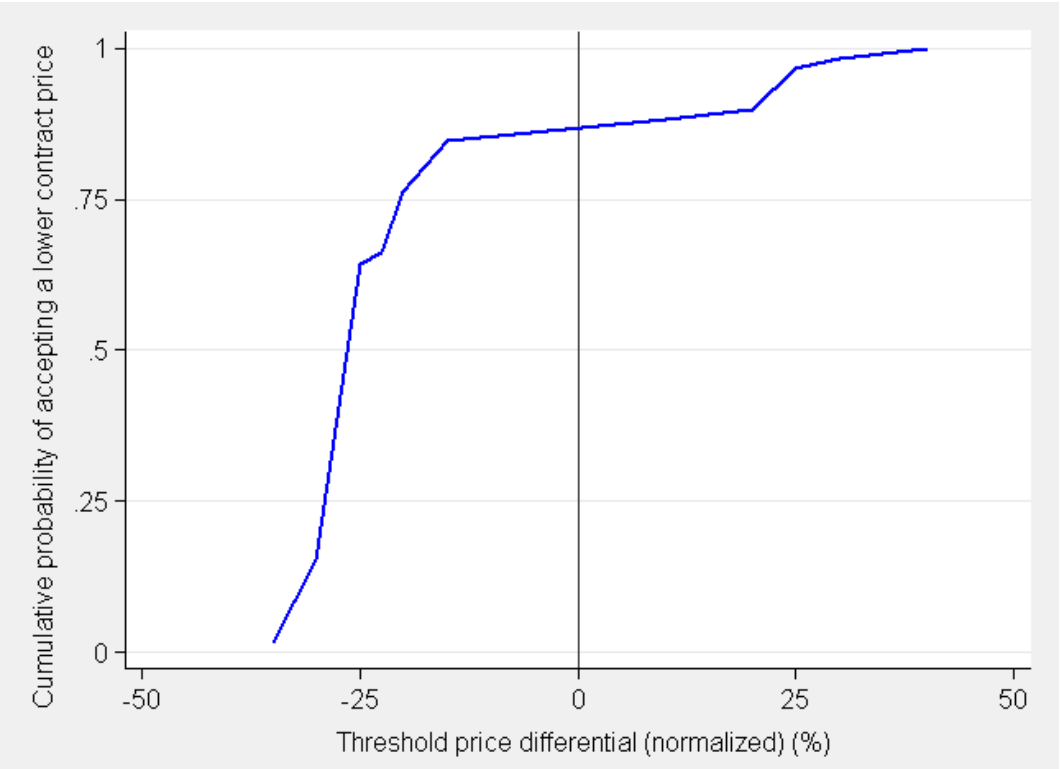
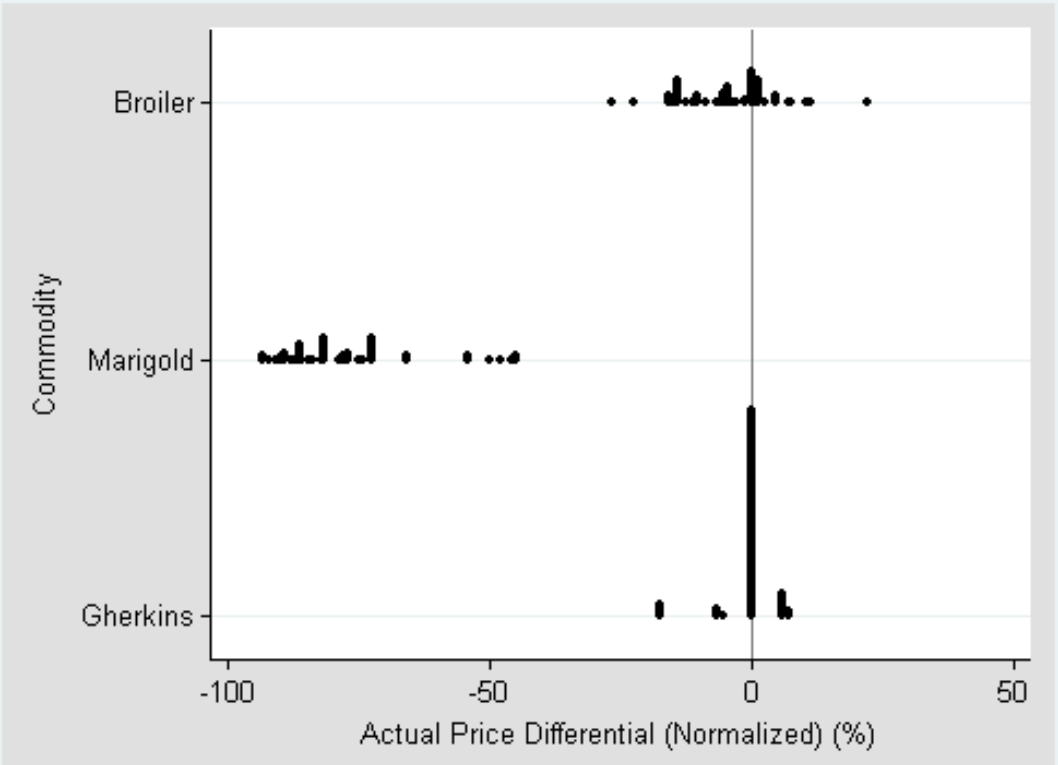


Table 11.4: Summary Statistics of Price Series for Selected Contract Commodities

Variable	Gherkins				Marigold				Broiler			
	Mean	(SD)	Min.	Max.	Mean	(SD)	Min.	Max.	Mean	(SD)	Min.	Max.
Threshold price differential (normalized) (%)	9	(4.5)	-13	14	-17	(18.1)	-35	40	-2	(5.1)	-13	13
Contract price(in Rs./kg)	17	(1.4)	14	18	3	(0.2)	2	3	43	(1.1)	35	44
Market price (in Rs./kg)	17	(1.1)	14	18	16	(8.6)	5	40	45	(3.9)	35	58
Actual price differential (normalized) %	-1	(4.7)	-18	7	-78	(12.9)	-93	-45	-4	(8.3)	-27	22
Number of contract farmers	78				59				71			

[1] Figures have been rounded off to the nearest whole number, so the actual price differential (normalized) could appear inconsistent with the contract and market price.
[2] Contract price is contract price at settlement time corresponds to P_{ct} in the text.
[3] Market price at settlement time corresponds to P_{mt} in the text.
[4] Normalized threshold price differential is defined as $\left[\frac{P_{ct}-E(P_{mt})}{E(P_{mt})}\right]_i \times 100$.
[5] Normalized actual price differential is defined as $\frac{P_{ct}-P_{mt}}{P_{mt}} \times 100$.
[6] SD means standard deviation, Min. means minimum, Max. means maximum.
[7] The data draws only on Phase 2 of the Farmer Survey.

Figure 11.4: Commodity-specific Price Differential at time of Sale, 2009-10



risk averse farmers to be willing to pay a premium for the 'insurance' and hence settle for lower contract price (Gow et al., 2000; Minten et al., 2009; Bellemare, 2010).

Perhaps more importantly, in the context of relationship farming, farmers often need to maintain relationships into the future.[75] This might trump narrow short-term calculus of price differentials, even at the cost of current profits, reflecting the repeated strategic interactions of contracting. The value of the contractual relationship thus goes beyond the price premium a farmer can get over alternate crops or marketing channels, and includes benefits in terms of reduced search, reputation and transactions costs, uncertainty, access to inputs, and so on.

Just as the prospect of future relationship with the firm matters to a farmer, the duration of the farmer's pre-existing relationship with the firm could influence the probability that the farmer is willing to accept a contract price that is lower than the spot market or alternative price. The longevity of prior relationship can have different implications depending on the exact nature of the relationship. On the one hand, it could imply greater room or bargaining strength for the farmer so that he/she would be unwilling to settle for a contract price that is lower than the market price. On the other hand, it could also be the case that the farmer is willing to settle for less, owing to his/her familiarity with the firm. This is essentially an empirical question, without an unambiguous theoretical prior.

Quite apart from these, the value attached to a continued relationship can be strengthened by the nature of the firm-farmer interface. For example, a farmer, who has entered into contracts through social contacts might attach greater value to the relationship, embedded as it is in the farmer's social life. The farmer might, therefore, be more likely to have a lower threshold than one who has no social link to the firm.

The Regression Models and Variables

In order to map the different correlates of the farmer's threshold willingness to accept contracts that offer a price lower than the spot market and the levels of threshold differentials, I estimate

[75] In a different sense, Macchiavello and Morjaria (2009) estimates the value of relational contracts for flower producers in Kenya.

a set of regression models using data for 208 contract farmers for marigold, gherkins and broilers drawn from Phase 2 of the Farmer Survey.

The first model regresses a farmer's stated willingness to accept a contract that offers a price lower than the spot market or alternate price (a categorical variable that takes the value 1 if yes, and 0 otherwise) on variables that control for the different aspects outlined above. This is estimated as a probit, accounting for heteroscedasticity.

The second model is a linear regression of threshold differentials $\bar{D}_i$ on a similar set of controls, also controlling for heteroscedastic errors. By construction, thresholds fall below zero for those who state that they would accept contracts that offered a lower price than the alternative.

In essence, while the first model seeks to establish correlates of a contract farmer's stated tolerance for negative price differentials (or inclination to contractual commitment in the context of negative price differentials), the second model tries to get at the degree of tolerance or, alternatively, the magnitude of 'loyalty' to the contract firm. Both models use broadly the same sets of explanatory variables. Table 11.5 presents summary statistics for these. Any explanatory factor that affects thresholds negatively is, typically, associated positively with the probability of accepting a contract that offers a lower price.

The notion of relationships in this set of models is represented by five attributes. The first three attributes, each represented by a binary variable, are the nature of initial contact with the firm (with a binary value of 1 if contract was initiated on the basis of social networks or contact and 0 otherwise), the years of contracting experience or longevity of the relationship with the firm and the past history of default of a farmer, taking the value 1 if the farmer has ever been unable to deliver on the contract during his/her history with the firm and 0 otherwise. Two other 'relationship' attributes capture the notion of continuity in contract farming relationship, serving as proxies for the value of future relationship. The first captures the farmer's desire and intent to continue contracting and the second reflects a farmer's expectation that the firm would do so. In particular, these two measure the likelihood that the farmer will continue contracting with the firm (and likewise, the firm with the farmer) for the next three years on an ordinal scale of 1 to 5, with 1 being not at all likely and 5 being certain to continue. Anchoring the base at the middle value of

3 representing moderate likelihood, for each of the two attributes, two indicator variables enter the model as regressors, one representing greater than moderate likelihood and the other representing a lower than moderate likelihood of the relationship continuing.

The notion of generalized morality Platteau (1994a,b) is captured by a variable that measures the farmer's general attitude to the contracts, specifically, the farmer's view on how important it is to honor the contract on an ordinal scale of one to five, where one denotes that the farmer considers it extremely important to honor the contract and five, not at all. This is recast as a binary variable where zero denotes that the farmer believes it is relatively unimportant to honor the contract and one otherwise (i.e., those equal to or less than three). In addition, the model includes a binary 0-1 variable that takes the value one if the farmer has a written contract with the firm. It is worth noting that given the highly personalized and customized nature of the firm-farm interface, the presence of written contracts might be potentially endogenous, given that field officials deem it necessary to have written contracts when they believe that a particular farmer is more likely to transact with a firm with a written agreement rather than without. I run models that both include and exclude this variable.

Side-selling opportunity is represented by the distance of the farmer to the nearest paved road. Physical access to the alternate market proxies the transactions costs associated with the alternative for a farmer contemplating breach.

A set of price variables captures the dynamic of market prices and market structure, given that they are the source of arguably the most powerful incentives for breach. These merit discussion. The key variable is the actual price difference between contract and market price at the time of last delivery on the contract. This is normalized by the market price and is referred to in the table as the actual price differential (normalized).This variable carries information about realized prices P_{mt} and in the context of modeling tolerance of negative thresholds serves as a proxy for information on the market structure.

The (normalized) actual price differentials enters the model in different ways in order to take into account the structure of the hypothesized relationship. Importantly, the model distinguishes those farmers who are tolerant of a negative price differential from those who would accept a

contract only if the contract price is at least as large as the market price. Given a contract price, if the actual price differential is high, i.e., the market price P_{mt} is low relative to a given contract price, given stable expectations, it is reasonable for farmers to expect that firms would seek to drive down the contract price, and farmers would have to be content with lower contract premia or price differentials. Thus, when the actual price differentials are positive, one would expect thresholds ($\bar{D}_i$)to be correlated negatively with actual price differential (D_{it}). For those whose threshold is negative and farmers are willing to accept a contract price discount, it is reasonable to expect that contract firms would not be able to drive down the contract price below the alternative market price without limit, while still having the farmer maintain the relationship. In this case, the normalized threshold can be expected to have a non-negative relationship with the actual normalized price differential.

Several versions of this basic model were run to test the robustness of the estimated relationships. In the models presented here, the actual normalized price differential enters both on its own and interacted with an indicator variable for positive thresholds to capture possible differences in the behavioral responses. Tables 11.6 and 11.7 list the variables included in each model.

Further, a binary variable indicating if the actual contract price was higher (taking the value one if $P_{ct} \geq P_{mt}$) is included. Whenever the actual contract price is higher than the prevailing market price or competitor price, one would expect a farmer to have a higher threshold of acceptance, since it would not be in the farmer's interest to voluntarily accept a contract price that is lower.

Both models include an interaction term between the dummy for social contact and the actual normalized price differential to reflect interaction effects. This term picks up the crucial relationship between price-based incentives and relation-based incentives for committing to contracts. The sign on the coefficient of this variable indicates the direction of influence of one, given the level of the other.

Other factors that might push the farmer to sidesell including outstanding debt, land size, relative poverty enter the model as explanatory variables. Personal characteristics are represented by farmer's age, dummy variables for education level and the education level of the most educated

Table 11.5: Summary Statistics of Dependent and Explanatory Variables

Variable	Mean or Proportion	Standard Deviation	Minimum	Maximum
Dependent variables				
(D) Accept a contract when contract price < market price (1=yes)	47%	NA	0	1
Threshold (Normalized) (%)	-2	15	-35	40
(D) Contractual performance: honored the contract in full	79%	NA	0	1
Explanatory variables				
Price variables and sideselling opportunity				
Actual Price Differential (Normalized) (%)	-24	35	-93	22
Actual Price Differential * Dummy for Threshold > 0	-1	4	-27	8
(D) Contract price is higher (1=yes)	49%	NA	0	1
Distance from the roadhead (kms.)	1	1	0	10
Relationship variables				
(D) Social contact with firm (1=yes)	39%	NA	0	1
Length of relationship (in years)	7	6	1	24
(D) Firm less than likely to continue (1=yes)	5 %	NA	0	1
(D) Firm more than likely to continue (1=yes)	92%	NA	0	1
(D) Farmer less than likely to continue (1=yes)	8 %	NA	0	1
(D) Farmer more than likely to continue (1=yes)	72%	NA	0	1
(D) Past default (1=yes)	47%	NA	0	1
Price differential-social relation variable				
Social contact * Actual price differential (normalized)	-4	15	-93	22
"Generalized Morality" and enforcement				
(D) Important to honor the contract (1=yes)	98 %	NA	0	1
(D) Power in relationship (1=yes)	3 %	NA	0	1
(D) Firm stops contracting if farmer breaches (1= yes)	6 %	NA	0	1
(D) Written contract (1=yes)	56 %	NA	0	1
Personal characteristics				
Age (in years)	43	12	22	80
(D) Social group:Scheduled Castes/Tribes (1=yes)	8 %	NA	0	1
Education level of the contract farmer		NA		
(D) Illiterate (1=yes)	23 %	NA	0	1
(D) Below secondary (1=yes)	4 %	NA	0	1
(D) Completed Secondary or High School (1=yes)	28 %	NA	0	1
Education level of the most educated member				
(D) Illiterate (1=yes)	7 %	NA	0	1
(D) Below secondary (1=yes)	3 %	NA	0	1
(D) Completed Secondary or High School (1=yes)	42 %	NA	0	1
(D) Poor (bottom 40% in the village)	33 %	NA	0	1
Outstanding Debt (in '000 Rs.)	141	239	0	2000
Land owned by household (in acres)	5	5	0	45
Risk and ambiguity aversion				
Risk aversion * Coefficient of variation in spot market price	12	20	0	53
(D) Ambiguity averse	56 %	NA	0	1
(D) Risk averse	45 %	NA	0	1
Commodity fixed effects and intercept				
(D) Gherkins	38 %	NA	0	1
(D) Marigold	28 %	NA	0	1

[1] Farmer Survey, Phase 2,2009-10.
[2] (D) refers to binary variables, for which proportions are reported.
[3] NA means Not Applicable.
[4] Figures are rounded off to the nearest whole number.

member of the household. An indicator variable captures social group, in particular, whether the farmer belongs to Scheduled Castes or Tribes.[76]

To see if thresholds might be associated with attitudes to risk and ambiguity, two variables are included. Ambiguity aversion is denoted by a binary variable that takes the value 1 if a farmer chose an option which disclosed the chances of success in a draw over another that did not.(Chapter 7 has the details of the experiment). If contracting offers less ambiguity in terms of price realizations, a farmer averse to ambiguity might be more likely to accept a contract with a contract price lower than the market price or have lower thresholds. The second variable interacts an indicator variable for risk aversion with the coefficient of variation of the alternative or spot market price. The risk aversion dummy is set equal to one if a farmer rejected a fair bet in an experiment that was part of the survey and zero otherwise. As long as there is no price risk in the alternative or spot market, contracting resolves no price risk and offers no insurance against it. So one would not expect risk aversion to matter when the variation in alternative price is very low or close to zero. On the other hand, if this were not the case, then a risk averse farmer would seek insurance against price volatility via contracting. The interaction variable captures this aspect and is expected to be related positively to farmer tolerance of a lower contract price.

The models include controls for commodity fixed effects in the form of contract commodity dummies, rather than village dummies, because of the collinearity between the two. It controls for some crucial unobserved differences across commodities. For instance, the nature of contract farming arrangement varies across the commodities, across a number of features, including crop duration, manner of selection of contract farmers, profile of the field officials and differences in agro-climatic and socio-economic conditions that drive firms to operate in some areas rather than others conditioned on the characteristics of the commodity.

[76]The base for comparison can be categorized as other backward classes. In Tamil Nadu, backward classes (BCs) and most backward classes (MBCs) are together equivalent to the other backward classes used commonly elsewhere in India (see www.tn.gov.in/department/ bcmbc.htm). Gender and language were not included given the context of the Farmer Survey, where all farmers were male and all were primarily Tamil speaking. The variables for religion were dropped because of collinearity issues.

Estimation Results

The regressions broadly corroborate the preceding descriptive analysis. Table 11.6 presents the results of the probit model that regresses the probability of accepting a contract that offers a price lower than the expected alternative price, along with the estimated average marginal effects of each variable on the probability of a farmer accepting a contract price lower than the expected market price. This model classifies 96% of the observations correctly. Specification tests such as the Hosmer-Lemeshow and Wald suggest that this model is correctly formulated.[77]

Table 11.7 contains the results of the linear regression of normalized thresholds. Two versions are presented here, both explaining as much as 84% of the variation in the dependent variable.

A salient finding in the context of this work is that relationship matters for contractual commitment. In the probit model of tolerance of negative threshold, a test for joint significance of the relationship variables strongly rejects the null hypothesis that relationships do not matter.

Contract farmers, whose contact with the firm comes through social networks and relations are more likely to accept a contract even when the contract price falls below the alternate price they can get. Similarly, the continuity of relationships (or the fact that contracting relationships represent repeated interaction) matters. Whenever a farmer expects that the firm will return in the future to contract with him/her, the higher the probability of accepting a negative threshold price differential. Similarly, the less inclined a farmer is to continue the contracting relationship with the firm into the future, the less the likelihood of accepting a contract that offers a price lower than expected spot market price. This latter in particular can be interpreted as the farmer being willing to accept a unit price that is lower than in the alternate market only to the extent that he/she values the continuity of the contractual relationship.[78] A farmer who has defaulted on a contract before is less likely to accept a contract that offers a lower price and is more likely to default again.

[77]The Hosmer-Lemeshow statistic tests the null hypothesis that a specified binary response model lacks a good fit. It partitions observations into ten equal groups based on ascending order of predicted probability. It is computed as $HL = \Sigma_{j=1}^{10} \frac{(O_j - E_j)^2}{E_j(1-E_j/n_j)}$ where, n_j is the number of observations in the jth group, O_j is the observed number of cases in the jth group, E_j is the expected number of cases in the jth group. So when the the null is rejected, it suggests that there is no evidence of lack of fit.

[78]Note that for both these cases the base for comparison is that the firm or farmer is somewhat likely to continue the relationship. So the variables discussed here represented degrees of certainty of continued relationship relative to this base.

This latter suggests a certain fuzziness surrounding enforcement of contracts, reflecting perhaps the presence of excusable breach or undetected breach and the fact that these might perpetuate breach in the future.

A written contract has a statistically significant positive association. Owing to the potential endogeneity of this variable, two versions are run, as a robustness check (Table 11.6). When 'written contract' is excluded from the set of explanatory variables (Model 1), the education level of the farmer begins to matter. In particular, a farmer who is moderately educated is more likely to accept a contract price lower than the expected spot market price. This reflects perhaps that this group is most likely to have written contracts. This is consonant with views held by agribusinesses that illiterate farmers are unable to commit to written contracts and the well-educated are averse to them.

These results carry through for the most part to the levels of threshold (Table 11.7). The idea that relationship farming influences contractual commitment is indicated by the statistical significance of the social relation variable, so that those who initiated contracts with the firm based on social contacts have significantly lower thresholds. In addition, whenever farmers value the relationship enough to continue contracting in the future, the threshold of contract acceptance is lower. Those who have defaulted at least once earlier tend to have higher thresholds, implying lower tolerance for the negative threshold price differentials. Presumably, the fact that their prior breach was excused or gone unnoticed (for otherwise, they would not be contract farmers at the time of the survey) leave them less pressed to settle for a contract price that is driven below the expected market price. All of these results hold, after controlling for commodity fixed effects. As indicated in earlier sections, marigold has significantly lower thresholds (and a greater proportion who are tolerant of negative thresholds) than is true for gherkins or broiler.

In both the models (threshold tolerance as well as magnitude of threshold differentials), even as the relationship variables emerge statistically significant in expected ways, it is apparent that price differentials provide powerful incentives for breach. This opposes the impact of relationship in important ways.

The probability that a farmer is willing to accept a negative threshold price differential is

associated negatively with the actual price differential (normalized). It is intuitive that as long as firms are seen to offer a premium over alternative markets, the farmer is unlikely to accept a contract that does not do so. Importantly, as hypothesized, for those with a positive threshold, the actual price differential is related positively to the propensity on the part of the farmer to concede to a lower priced contract.

Farmers located farther from a paved road tend to accept contracts that offer a lower price. Presumably, since firms pick up contracted produce at the farmgate, the savings for the farmer in transportation and related costs make it possible for the farmer to accept contracts even if the price were below the alternative price he or she expects to get. A variation of this model expands the set of regressors to include interaction terms. In this case, most of the results of the previous model remain valid, excepting the one representing social contact (Table 11.7).

The interaction between social contact and normalized actual price differential has a significant negative association with threshold price differentials. This implies that for those contract farmers who initiated contracting based on social contact, a lower price differential is associated with lower threshold. Alternatively, given a particular level of actual (normalized) price differential, social contact induces farmers to accept a contract that is much lower than the alternative spot market price. This suggests that firms might be exploiting relationships more than farmers do.

11.6.2 Sideselling behavior

Noting that the threshold price differential ($\bar{D}_i$) reflects the orientation of the farmer towards the contract (in terms of the threshold price differential and the range of contract acceptance), this conceptualization can be extended to side-selling behavior at the time of delivery and settlement, when the actual spot market or alternative price P_{mt} is revealed. In particular, whenever realized spot market price at the time of delivery and settlement is higher than the expected market price, D_{it}, the actual price differential falls in the range where contracts are rejected. This implies that farmers would be tempted to breach. Without restraints on sideselling, myopic profit maximizing farmers would choose to side-sell, breaching the contract.

The approach here is to model the contractual performance (or honoring the contract in full

Table 11.6: Tolerance of Negative Differentials: Probit Model of the Probability that a Farmer Accepts a Contract Price lower than the Market Price

Dependent variable: Accepting a Contract when $P_c < P_m$

Variable	**Model 1 (excluding "written contract")**			**Model 2 (including "written contract")**		
	Coefficient	**Standard error**	**AME (S.E.)**	**Coefficient**	**Standard error**	**AME (S.E.)**
Explanatory variables						
Price variables and sideselling opportunity						
Actual Price Differential (Normalized)	-0.01	0.09	0.00 (0.01)	0.00	0.08	0.00 (0.00)
Actual Price Differential * Dummy for Threshold > 0	0.89 ***	0.27	0.05 (0.01)	0.88 ***	0.25	0.05 (0.01)
Contract price is higher (1=yes)	-1.95 ***	0.75	-0.17 (0.06)	-2.03 ***	0.78	-0.17 (0.06)
Distance from the roadhead (kms.)	0.37	0.24	0.02 (0.01)	0.33	0.25	0.02(0.01)
Relationship variables						
Social contact with firm (1=yes)	3.31 ***	1.02	0.22 (0.07)	3.37 ***	1.03	0.22 (0.07)
Length of relationship (in years)	-0.01	0.08	0.00 (0.00)	0.00	0.09	0.00 (0.01)
Firm less than likely to continue (1=yes)	1.86	1.71	0.15(0.14)	1.81	1.69	0.14 (0.14)
Firm more than likely to continue (1=yes)	2.81 **	1.26	0.11 (0.07)	2.83 **	1.24	0.11 (0.07)
Farmer less than likely to continue (1=yes)	-3.81 ***	1.35	-0.15 (0.06)	-3.74 ***	1.39	-0.16 (0.06)
Farmer more than likely to continue (1=yes)	-1.22	0.9	-0.08 (0.05)	-1.12	0.87	-0.08 (0.04)
Past default (1=yes)	-6.87 ***	1.13	-0.23 (0.04)	-7.03 ***	1.19	-0.24 (0.04)
Price differential-social relation variable						
Social contact * Actual price differential (normalized)	-0.35 ***	0.10	-0.02 (0.01)	-0.35 ***	0.10	-0.02(0.00)
"Generalized Morality" and enforcement variables						
Important to honor the contract (1=yes)	2.01	1.38	0.08 (0.08)	1.92	1.34	0.08 (0.07)
Power in relationship (1=yes)	0.20	0.74	0.01 (0.05)	0.12	0.73	0.01 (0.05)
Firm stops contracting if farmer breaches (1= yes)	-0.05	0.61	0.00 (0.04)	-0.18	0.60	-0.01 (0.03)
Written contract (1=yes)	NA	NA	NA	1.24 **	0.57	0.08 (0.05)
Personal characteristics						
Age (in years)	0.00	0.02	0.00 (0.00)	0.00	0.02	0.00 (0.00)
Social group:Scheduled Castes/Tribes (1=yes)	-0.97	1.09	-0.05 (0.04)	-1.04	1.14	-0.05 (0.04)
Education level of the contract farmer						
Illiterate (1=yes)	-0.15	1.17	-0.01 (0.07)	-0.05	1.20	0.00 (0.07)
Below secondary (1=yes)	0.15	0.88	0.01 (0.06)	0.14	0.87	0.01 (0.05)
Completed Secondary or High School (1=yes)	1.30 *	0.76	0.08 (0.07)	1.15	0.72	0.07 (0.06)
Education level of the most educated member						
Illiterate (1=yes)	1.93 *	1.06	0.15 (0.09)	2.68 ***	1.01	0.21 (0.06)
Below secondary (1=yes)	1.17	1.02	0.08 (0.07)	1.08	0.97	0.07 (0.07)
Completed Secondary or High School (1=yes)	0.47	0.64	0.03 (0.04)	0.43	0.63	0.03 (0.04)
Poor (bottom 40% in the village)	0.12	0.78	0.01 (0.05)	0.07	0.75	0.00 (0.05)
Outstanding Debt (in '000000 Rs.)	-0.26	0.54	-0.02 (0.03)	-0.27	0.60	-0.02 (0.04)
Land owned by household (in acres)	0.02	0.03	0.00 (0.00)	0.02	0.03	0.00 (0.00)
Risk and ambiguity aversion						
Risk aversion * Coefficient of variation in spot market price	0.06	0.04	0.00 (0.00)	0.06	0.04	0.00 (0.00)
Ambiguity averse	0.64	0.48	0.04 (0.03)	0.62	0.45	0.04 (0.03)
Commodity fixed effects and intercept						
Gherkins	1.85 *	1.00	0.10 (0.06)	3.11 **	1.29	0.14 (0.04)
Marigold	12.61 **	5.78	0.67 (0.06)	13.1 **	5.71	0.68 (0.05)
Intercept	-7.80 ***	2.68	NA	-8.76 ***	2.76	NA
N		208			208	
Log-likelihood		-22.9			-22.56	
Wald's χ^2		$\chi^2_{(30)} = 702.34$			$\chi^2_{(31)} = 706.33$	
p-value (Prob > χ^2)		0.00^{***}			0.00^{***}	
McFaddens R-squared		0.84			0.84	
Hosmer-Lemeshow χ^2_7		0.78			3.74	
p-value (Prob > χ^2)		0.98			0.81	
Percentage of responses classified correctly		95.67%			95.67%	
Wald test for joint significance of relationship variables						
Wald's χ^2_7		58.58			60.77	
p-value (Prob > χ^2)		0.00^{***}			0.00^{***}	

Significance levels : * : 10% ** : 5% *** : 1%

[1] Farmer Survey, Phase 2,2009-10.
[2] Figures have been rounded off to two decimals.
[3] AME refers to Average Marginal Effects, the mean of partial effects evaluated at observed values. This is different from the Marginal Effect at the Mean or MEM.

Table 11.7: Correlates of Farmers' Threshold Price Differentials: Results from Linear Regression Models

Dependent Variable: Normalized threshold differentials				
	Least Squares Model 1 (Without price-social Interaction)		**Least Squares Model 2 (With price-social relation Interaction)**	
Variable	**Coefficient**	**Standard error**	**Coefficient**	**Standard error**
Explanatory variables				
Price variables and sideselling opportunity				
Actual Price Differential (Normalized)	0.19 *	0.10	0.18 *	0.10
Actual Price Differential * Dummy for positive threshold > 0.00	-2.45 ***	0.28	-2.45 ***	0.28
Contract price is higher (1=yes)	6.50 ***	1.72	6.47 ***	1.73
Distance from the roadhead (kms.)	0.29	0.63	0.28	0.63
Relationship variables				
Social contact with firm (1=yes)	-2.57 *	1.47	-2.11	2.09
Length of relationship (in years)	-0.09	0.12	-0.09	0.12
Firm less than likely to continue (1=yes)	1.85	2.94	1.87	2.96
Firm more than likely to continue (1=yes)	2.23	1.64	2.33	1.70
Farmer less than likely to continue (1=yes)	1.98	4.4	1.9	4.51
Farmer more than likely to continue (1=yes)	-2.61 **	1.29	-2.60 **	1.28
Past default (1=yes)	1.48	1.41	1.52	1.39
Price differential-social relation variable				
Social contact * Actual price differential (normalized)	NA	NA	0.01	0.04
"Generalized Morality" and enforcement				
Important to honor the contract (1=yes)	5.01 *	2.81	4.93 *	2.89
Power in relationship (1=yes)	0.03	1.06	0.07	1.08
Firm stops contracting if farmer breaches (1= yes)	-3.04	2.36	-3.09	2.37
Written contract (1=yes)	-0.27	2.03	-0.36	2.08
Personal characteristics				
Age (in years)	0.04	0.05	0.04	0.05
Social group:Scheduled Castes/Tribes (1=yes)	-4.03	2.60	-4.07	2.57
Education level of the contract farmer				
Illiterate (1=yes)	-2.70	2.47	-2.71	2.47
Below secondary (1=yes)	-2.62	2.27	-2.59	2.29
Completed Secondary or High School (1=yes)	-3.46 *	1.88	-3.41 *	1.89
Education level of the most educated member				
Illiterate (1=yes)	-1.65	2.44	-1.71	2.48
Below secondary (1=yes)	-0.38	1.67	-0.40	1.68
Completed Secondary or High School (1=yes)	1.54	1.49	1.54	1.49
Poor (bottom 40% in the village)	0.17	1.13	0.19	1.13
Outstanding Debt (in '000000 Rs.)	-3.24	2.80	-3.17	2.82
Land owned by household (in acres)	-0.11	0.08	-0.11	0.08
Risk and ambiguity aversion				
Risk aversion * Coefficient of variation in spot market price	0.00	0.05	0.00	0.05
Ambiguity averse	1.32	1.10	1.34	1.10
Commodity fixed effects and intercept				
Gherkins	2.62	3.13	2.95	3.25
Marigold	-5.27	8.58	-5.14	8.52
Intercept	-5.28	4.86	-5.75	4.73
N	208		208	
R^2	0.84		0.84	
F statistic	$F_{(30,177)}$=68.51		$F_{(31,176)}$=66.08	
p-value (Prob > F)	0.00***		0.00***	
Root Mean Squared Error	6.29		6.31	

Significance levels : * : 10% ** : 5% *** : 1%

[1] Farmer Survey, Phase 2,2009-10.
[2] (D) refers to binary variables, for which proportions are reported
[3] NA means Not Applicable

without any sideselling on contracted produce), as reported by the farmer, as a function of threshold differentials, actual price differentials and 'relationship' variables. The dependent variable in this probit model is binary, with 0 indicating that the contract farmer sidesold some part of the contracted produce in breach of the contract during the most recent contracting season completed, and 1 if the farmer honored the contractual commitment in full.[79]

The regression model estimated offers interesting insights (Table 11.8). As before, variables representing side-selling opportunity, relationship, personal characteristics and views on how much power farmers perceive to have in the relationship as well as the importance of honoring the contract are included.

The results from Model 1 show that price variables influence sideselling behavior. Whenever the contract price offers a premium over the alternative price, i.e., $P_{ct} > P_{mt}$, the probability of honoring the contract in full is higher, and the higher the magnitude of difference between the contract price and actual spot market or alternative price, the more likely the farmer is to honor the contract.

Three variables capturing relationship are statistically significant. The farmer's perception of the likelihood of the firm continuing the contractual relationship with the farmer in the next three years makes it less likely a farmer would sidesell. The prospect of continued contracting is thus associated with better contractual performance. This variable represents the farmer's expectation of the firm's action. As for the farmer's own inclination, interestingly, whenever a farmer is less than likely to want to continue contracting with the firm, the contractual compliance is better, i.e. the probability of honoring the contract in full is higher when the farmer is likely to discontinue contracting. It is likely that farmers who have decided to stop or switch contract firms (or buyers) care enough or are more concerned about their reputation with prospective future buyers, that they want to be seen to be honoring contracts. This is especially true in the current setting, where marigold, gherkins and broiler contract firms are clustered and are well connected with each other.

[79]While self-reporting is unreliable in most circumstances, the respondents in the Farmer Survey were surprisingly candid. That said, it is recognized that any bias in reporting is downward. Farmers were more reluctant to state the proportion of produce they sidesold. Hence the use of a dichotomous dependent variable.

Broiler firms inform each other of defaulters, and the field officers of gherkins firm interact closely with each other during the course of their work.

Furthermore, when the contract farming relationship has been initiated through social contact, the probability of honoring the contract is higher.

As before, distance of the farmer's location from the main roadhead, denoting remoteness and therefore of transactions costs to accessing markets, is significantly positively associated with probability that a farmer honors the contract. This conforms to the notion among some agribusinesses that the more remotely located farmers tend to be more reliable, since they have poorer access to markets (Chapter 8).

The lower the levels of education of the contracting farmer, the greater the likelihood of side-selling. Given controls for "generalized morality" and written contracts, this reflects perhaps unfamiliarity with the demands of formal contracts, whether oral or written. Those who have more outstanding debt are also more likely to sidesell, as are those who are poorer. This provides evidence that supports the notion of excusable breach, sidesale often occurs due to the pressing need of some individuals, which is then pardoned. Those contract growers belonging to the marginalized communities are also more likely to side selling, likely reflecting the exigencies of their socio-economic condition.

These results are fairly robust across specifications. When commodity fixed effects are introduced, the actual price differential (normalized) and the binary variable indicating if the alternative or spot market price was lower at the time of sale become statistically insignificant (Table 11.8). However, this is not surprising since the scale of this differential coincides with particular commodities. In the absence of commodity dummies, social contact loses statistical significance, emphasizing cross-commodity differences in contracting experience and the way social contact is leveraged to improve contractual performance. The interaction term between social contact and actual normalized price differential remains insignificant across specifications. This suggests that on an average, given the level of price differential, social contact does not improve contractual performance significantly. So too, given social contact, the actual price differential does not contribute significantly to improving contractual performance.

A battery of tests suggests that both models perform well, as indicated by the Wald and the Hosmer-Lemeshaw χ^2 tests. The models presented here (both without and with commodity dummies) classify 93% of the observations correctly, respectively.

11.6.3 Relationship and Contractual Performance: Extent and Limits

It is apparent from the econometric analysis that relationships are significantly associated with contractual performance, so that the value of continued future transactions and social contact with the firm boost compliance, even when spot market price conditions might tempt farmers to breach.

Figure 11.5 summarizes this finding. The predicted probability of honoring the contract is plotted against actual normalized price differentials.[80] The theoretical prediction for a one-shot interaction would suggest that for any differential less than zero, farmers would not honor the contract, whereas they would if the differential were above 0. Empirically, however, even when the actual price differential is less than zero, there is a positive probability of farmers honoring the contract fully. As the figure points out, a linear fit to the predicted probabilities of honoring the contract suggests that this probability is fairly high even when differentials are considerably negative. This reflects the value of future relationships as well as the importance of social contact, supporting the Folk Theorem result. It is noteworthy that even when $D_{it} > 0$ the probability of honoring the contract is not one. Price incentives notwithstanding, there is rarely perfect compliance and there is always some incidence of breach. This could reflect in part failure to deliver on account of personal exigencies, yield loss and excusably small quantities of side sale.

Figure 11.6 plots the cumulative distributions of the probability of tolerating negative price differentials as well as the probability of honoring the contract. For each of these, it is clear that when contracting is initiated on the basis of social contact, the distribution first order stochastically dominates that without social contact. This further corroborates the positive role of relationships in enforcing contracts.

While the "self-enforcing" nature of contract farming schemes in India comes through clearly, one must be careful not to overstate the ability of personalized interaction to ensure contractual

[80] These predicted probabilities are generated by applying the estimated coefficients to the observed covariates for each contract farmer.

Table 11.8: Sideselling Behavior: Probit Regression of Probability of Honoring the Contract

Dependent Variable = Probability of honoring Contract (1=yes)

	Model 1 (Without Commodity fixed effects)			**Model 2 (With Commodity fixed effects)**		
Variable	**Coefficient**	**Standard error**	**AME (S.E.)**	**Coefficient**	**Standard error**	**AME (S.E.)**
Explanatory variables						
Price variables and sideselling opportunity						
Accept a contract when contract price < market price (1=yes)	-0.79	0.93	-0.10(0.14)	-0.57	0.71	-0.07(0.10)
Threshold (Normalized)	-0.03	0.02	0.00(0.00)	-0.03	0.02	0.00(0.00)
Actual Price Differential (Normalized)	0.02 *	0.01	0.00(0.00)	0.00	0.02	0.00(0.00)
Contract price is higher (1=yes)	0.80 *	0.46	0.11(0.05)	0.56	0.41	0.07(0.05)
Distance from the roadhead (kms.)	0.29 **	0.13	0.03(0.02)	0.32 **	0.14	0.04(0.02)
Relationship variables						
Social contact with firm (1=yes)	0.36	0.67	0.04(0.08)	1.58 *	0.88	0.20(0.08)
Length of relationship (in years)	-0.06	0.04	-0.01(0.00)	-0.08 *	0.04	-0.01(0.00)
Firm less than likely to continue (1=yes)	-1.89 *	1.05	-0.29(0.20)	-1.95 *	1.10	-0.30(0.21)
Firm more than likely to continue (1=yes)	-0.09	0.73	-0.01(0.09)	0.00	0.74	0.00(0.08)
Farmer less than likely to continue (1=yes)	1.27 *	0.74	0.13(0.06)	1.62 **	0.80	0.15(0.06)
Farmer more than likely to continue (1=yes)	-0.53	0.41	-0.06(0.05)	-0.44	0.44	-0.05 (0.05)
Past default (1=yes)	-0.42	0.46	-0.05(0.06)	-0.48	0.49	-0.06(0.06)
Price differential-social relation variable						
Social contact * Actual price differential (normalized)	0.00	0.01	0.00(0.00)	0.02	0.01	0.00(0.00)
"Generalized Morality" and enforcement						
Important to honor the contract (1=yes)	0.28	0.62	0.03(0.07)	0.21	0.69	0.02(0.08)
Power in relationship (1=yes)	-0.23	0.30	-0.03(0.04)	-0.31	0.30	-0.04 (0.04)
Firm stops contracting if farmer breaches (1= yes)	-0.30	0.50	-0.04(0.06)	-0.25	0.51	-0.03(0.06)
Written contract (1=yes)	-0.84	0.60	-0.11(0.09)	-0.39	0.67	-0.05(0.08)
Personal characteristics						
Age (in years)	0.01	0.01	0.00(0.00)	0.01	0.01	0.00(0.00)
Social group:Scheduled Castes/Tribes (1=yes)	-0.96 **	0.47	-0.14(0.08)	-0.93 **	0.46	-0.13(0.08)
Education level of the contract farmer						
Illiterate (1=yes)	-1.68 **	0.80	-0.26(0.15)	-1.68 *	0.86	-0.25 (0.16)
Below secondary (1=yes)	-1.60 **	0.78	-0.18(0.11)	-1.58 *	0.85	-0.17 (0.12)
Completed Secondary or High School (1=yes)	-1.14	0.81	-0.14 (0.12)	-1.19	0.88	-0.14 (0.13)
Education level of the most educated member						
Illiterate (1=yes)	0.16	0.59	0.02(0.07)	0.18	0.62	0.02(0.07)
Below secondary (1=yes)	-0.62	0.59	-0.07(0.07)	-0.89	0.69	-0.10(0.09)
Completed Secondary or High School (1=yes)	-0.23	0.47	-0.03 (0.06)	-0.35	0.50	-0.04(0.06)
Poor (bottom 40% in the village)	-0.58 *	0.33	-0.07(0.04)	-0.78 **	0.36	-0.09(0.05)
Outstanding Debt (in '000000 Rs.)	-1.19 **	0.52	-0.14(0.06)	-1.11 **	0.47	-0.13(0.05)
Land owned by household (in acres)	0.01	0.03	0.00(0.00)	0.01	0.03	0.00(0.00)
Commodity fixed effects and intercept						
Gherkins	NA	NA	NA	2.71 **	1.16	0.37 (0.04)
Marigold	NA	NA	NA	0.40	1.63	0.04(0.16)
Intercept	4.57 ***	1.42	NA	2.51	1.62	NA
N		208			208	
Log-likelihood		-44.07			-42.66	
Wald χ^2		$\chi^2_{(28)}$ =98.0			$\chi^2_{(30)}$= 127.3	
p-value (Prob > χ^2*)*		0.00***			0.00***	
McFadden R-squared		0.59			0.6	
Hosmer-Lemeshow χ^2_8 Goodness of Fit		9.53			3.27	
p-value (Prob > χ^2*)*		0.30			0.92	
Percentage of responses classified correctly		91.4%			91.4%	
Wald test for joint significance of relationship variables						
Wald's $\chi^2_{(7)}$		10.83			14.66	
p-value (Prob > χ^2*)*		0.14			0.04**	

Significance levels:∗ : 10%∗∗ : 5% ∗ ∗ ∗ : 1%

[1] Farmer Survey, Phase 2,2009-10.
[2] NA means Not Applicable.
[3] Figures rounded off to two decimal places.Hence, 0.00 represents a non-zero value.
[4] AME refers to Average Marginal Effects, the mean of partial effects evaluated at observed values.

Figure 11.5: Predictions of probability of honoring the contract by contract farmers, 2009-10

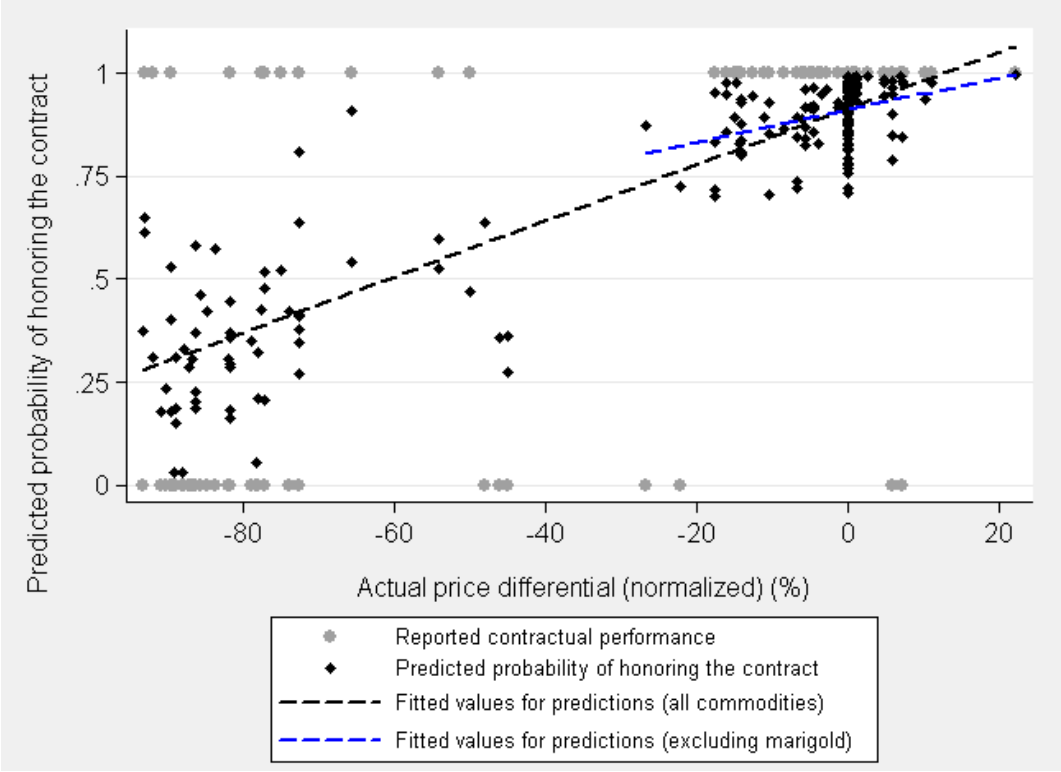
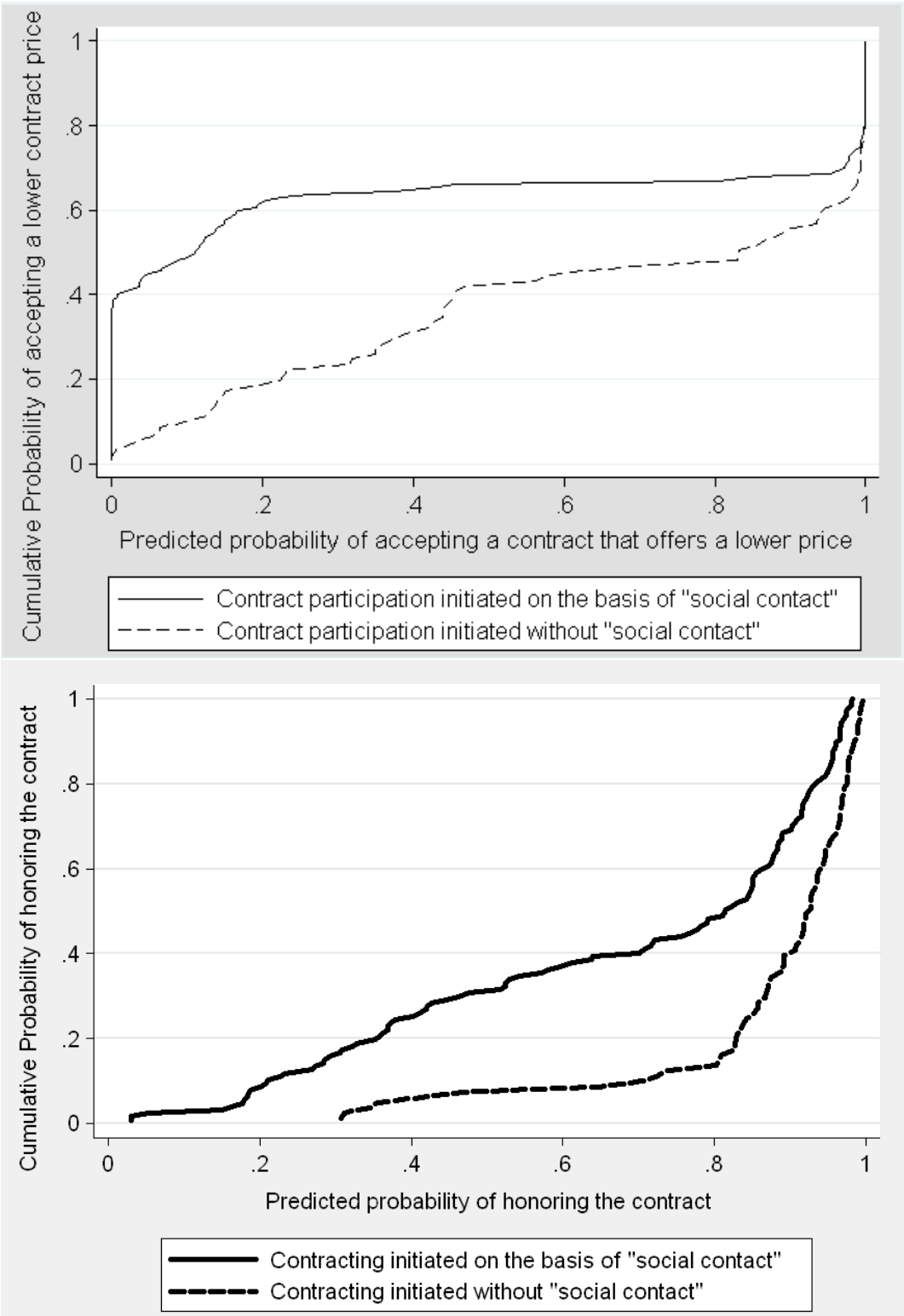


Figure 11.6: Social contact, Contractual Commitment and Performance by contract farmers, 2009-10



performance. First, the "relationship" variables rarely operate in isolation and typically work in tandem with price-based incentives (or disincentives). Second, there are significant differences across commodities in the relative effectiveness of self-enforcement strategies. So, the degree to which relationships matter for contractual performance is worth further investigation.

When price differential is positive ($D_{it} \geq 0$), relationships, be it social contact or the promise of continued contracting, reinforce farmer compliance with contractual commitments. Figure 11.7 shows simulated probabilities for honoring the contract, based on Model 2 presented earlier. As the likelihood of continued future contracting increases, the probability of honoring the contract in the current period increases. Similarly, offering a contract price higher than the alternate price always improves contractual performance, as does contracting initiated on the basis of social contact. This suggests the potential of substitutability between relationship and price incentives to achieve a given level of contract performance. It is noteworthy that the combination of greater certainty of future relationship and social contact can achieve contractual performance close to that of price-based incentives. This relationship could play out differently across different commodities.

Figure 11.8 illustrates powerfully that relationship farming has its limits and cannot hold its own as an enforcement strategy.[81] There exists a range of price differentials where relationship variables can kick in either to reinforce the positive price differential and thereby improve contract deliveries or counterbalance a negative differential and ensure greater commitment to contracts. But when the differentials are too low and negative, relationships are not powerful enough to ensure that farmers honor the contract. So too, when the price differentials are very high so that contract price offers a comfortable premium over the next best alternative, relationship variables do not contribute significantly to improving contractual performance, and are rendered irrelevant at that level.

The relative effectiveness of price versus relationship-based incentives in improving contractual performance could differ across commodities. Table 11.9 reports the estimated change in probability

[81]These probabilities were computed at the means of all continuous variables, at the modal value for dummy variables. The two lines represent change in the relationship variables, social contact, likelihood of firm continuing to contract and past default.

Figure 11.7: "Relationship" versus Price

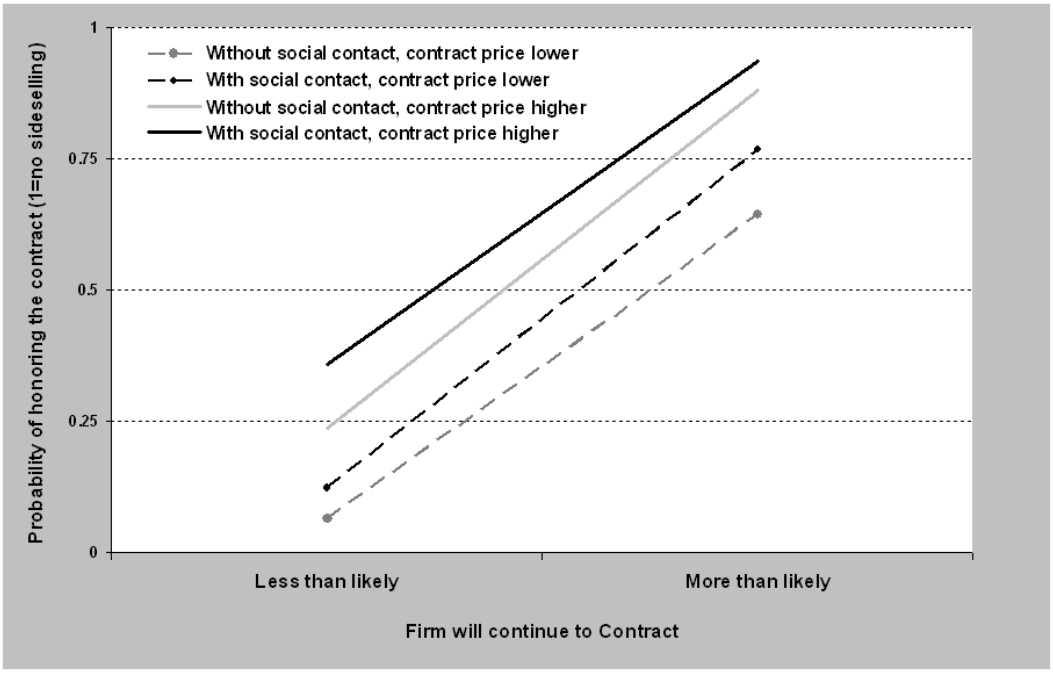


Figure 11.8: Relationship farming and contractual performance

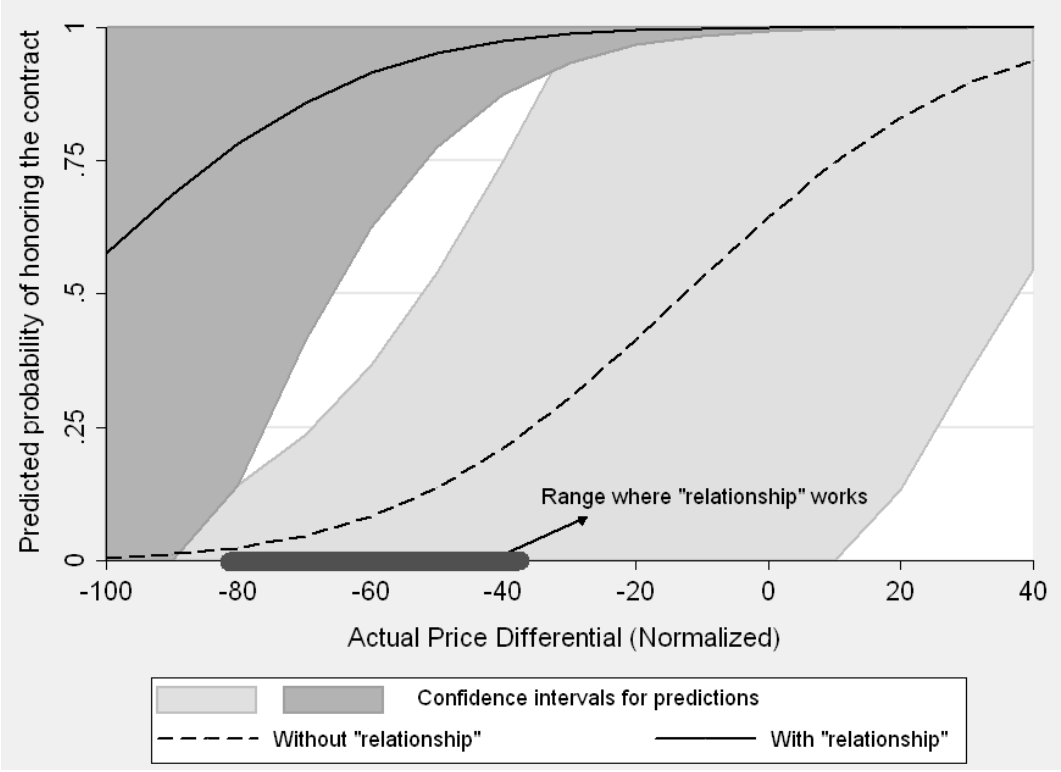


Table 11.9: How much do Relationships Matter for Contractual Performance? Some simulations.

Nature of Change	Change in probability of honoring the contract: Model 2 With Commodity Fixed Effects					
	Gherkins		Marigold		Broiler	
	ΔPr	95% C.I.	ΔPr	95% C.I.	ΔPr	95% C.I.
Effect of Social Contact $0 \rightarrow 1$						
When Contract Price $\geq$ 0 Market price	0.00	[-0.02 , 0.02]	0.29	[-0.44 , 1.01]	0.41	[-0.60 , 1.42]
When Contract Price $<$ 0 Market price	0.01	[-0.07 , 0.09]	0.46	[-0.21 , 1.12]	0.54	[-0.17 , 1.26]
Effect of Future Relationship $1 \rightarrow 5$						
Without Social Contact						
When Contract Price $\geq$ 0 Market price	0.19	[-0.66 , 1.03]	0.62	[0.12 , 1.12]	0.51	[-0.47 , 1.49]
When Contract Price $<$ 0 Market price	0.37	[-0.70 , 1.43]	0.46	[-0.31 , 1.23]	0.32	[-0.68 , 1.31]
With Social Contact						
When Contract Price $\geq$ 0 Market price	0.01	[-0.06 , 0.08]	0.42	[-0.87 , 1.72]	0.56	[-0.46 , 1.57]
When Contract Price $<$ 0 Market price	0.03	[-0.19 , 0.25]	0.60	[-0.36 , 1.56]	0.67	[0.16 , 1.17]
Effect of Price Differential $(P_c - P_m) < 0 \rightarrow \geq 0$						
Without Social Contact	0.01	[-0.05 , 0.07]	0.22	[-0.11 , 0.54]	0.22	[-0.11 , 0.54]
With Social Contact	0.00	[0.00 , 0.00]	0.04	[-0.20 , 0.28]	0.08	[-0.19 , 0.36]

[1] Farmer Survey, Phase 2,2009-10.
[2] Predictions and confidence intervals computed using STATA's SPOST commands as in Long and Freese (2005).
[3] Figures are rounded off to two decimal points.
[4] Predictions are evaluated at the mean of continuous variables, and for binary variables, it is evaluated at the modal value

of honoring the contract under different price differential and relationship status scenarios.[82] Estimated increases in probability are modest and statistically insignificant for gherkins unlike for marigold and broilers. For broilers, offering a price premium increases the probability of honoring the contract less than the impact that continued contracting or social network can achieve. For marigold and gherkins, the potential for continued relationship seems to achieve the greatest improvements in contract performance, though the differential effect is far greater for marigold than it is for gherkins. This offers a cautionary lesson that notwithstanding the role of relationships in improving contractual performance, social embededness of commerical exchange might have limits and relationships could well be held hostage to the vagaries of the market should the alternatives for the farmer prove too attractive.

Figures 11.9 and 11.10 sum up the results of the two probit models for each of the commodities in the study. Gherkins contract farmers are intolerant of negative thresholds, urging contracting firms to match one another's price, and tend to honor the contract. Marigold farmers have high stated tolerance for negative thresholds, because of the particular nature of the market, that places value on continued relationship with the firm. At the same time however, large negative

[82] These comparisons are not offered as rigorous tests of differences across commodities, but are merely indicative of such heterogeneity.

price differentials, also provide huge scope for breach.[83] So the role of relationship in improving contractual performance is often undermined by huge negative price differentials. For the marigold firm in question, it has been a constant struggle to maintain the contract farming arrangements. For broilers, the growers privilege relationships over price differentials and tend to honor their contractual commitments.

11.7 Concluding Remarks

This chapter examined enforcement issues in contract farming arrangements in India by combining perspectives of firms and farmers. Empirical evidence emphasizes that legal contract enforcement and the legality of contracts is peripheral in the context of contract farming practice, as personal relationships underpin virtually all effective exchange.

Further this is related only in part to the costs and inefficacy of formal enforcement mechanisms. Given the large number of defaulters, and the relatively small amounts of default, the costs of enforcement imply that the firms can only profitably recover these outstanding amounts from a fraction of them. In the case of a particular gherkins firm, assessments of the costs of enforcement suggest that the firm can profitably recover dures from no more than 3%- 26% of the defaulting farmers. This excludes other costs in terms of waiting times and firm's reputation. Indeed, this latter consideration drives firms to avoid legal mechanisms for contracting and enforcing, whenever feasible. Interviews with agribusiness executives suggest that firms tend to view court-based formal enforcement as detrimental to farm-firm relationships in a way that undermines the handshake ethic. It is important therefore to acknowledge the primacy of personal relationships in contract farming arrangements in India.

Both in terms of mode of contracting and enforcement, what we find here resembles what Harriss-White (2008) refers to as the "inter-penetration of the formal and informal" in an economy, rather than one or the other. In any given contract farming scheme, both oral and written contracts are in use, and there is similar diversity in enforcement mechanisms adopted by the firm even within the same scheme.

[83] This effect is somewhat exaggerated due to pooling data by quality and timing.

Figure 11.9: Predicted tolerance of negative threshold differentials, 2009-10

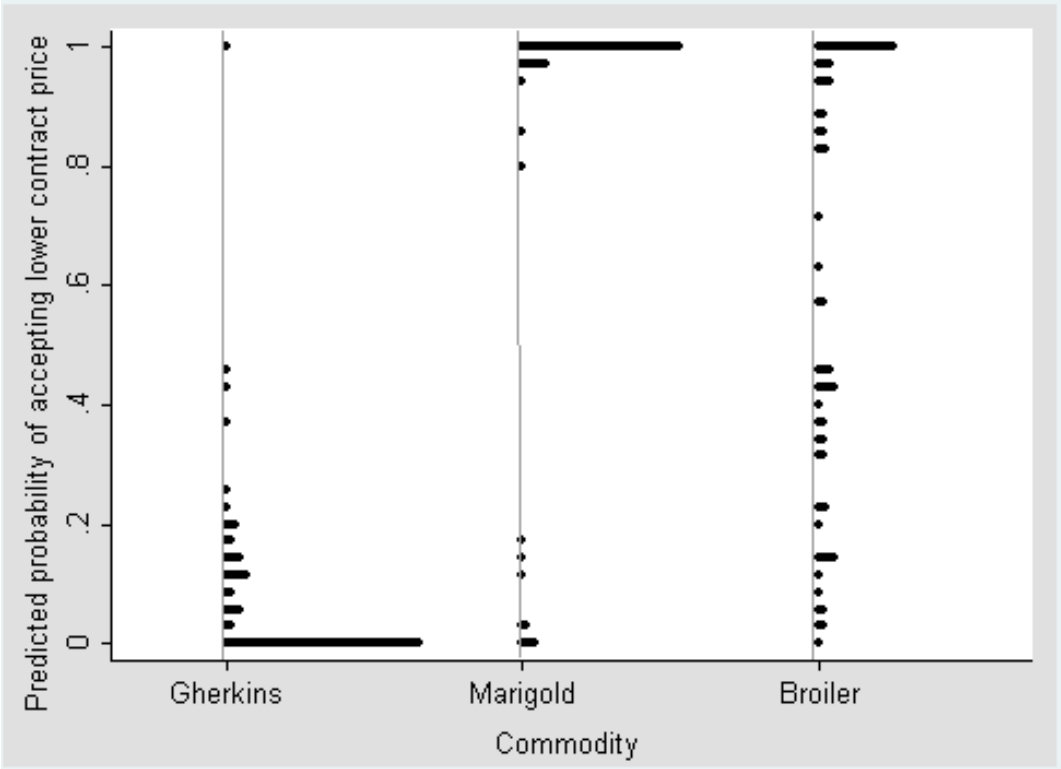
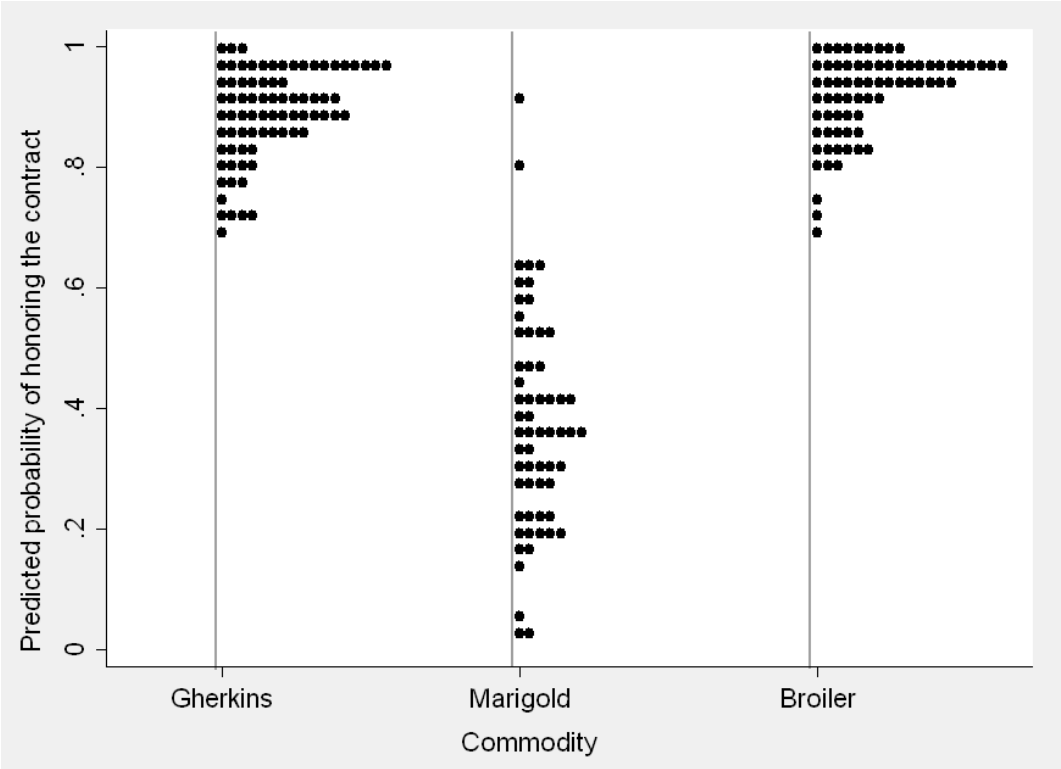


Figure 11.10: Predictions of probability of honoring the contract in full, 2009-10



Relationship farming is simultaneously a cause and consequence of friction in contract farming systems in India, where stability of arrangements is ensured by the maintenance of relationships.

Chapter 12

Conclusion

12.1 A Summary of Findings

The core of this study suggests that the ideological divide on the normative implications of contract farming in developing countries, and whether or not the state ought to promote such arrangements, represents a false binary. This emanates from the fact that particular theoretical frameworks that inform empirical work do not often speak to each other and are hence unable to reconcile the diverse and apparently contradictory evidence on the welfare outcomes of contract farming practice.

Within economics, the theoretical lens for analyzing contract farming has viewed the farmer as a unit of analysis, precluding a systemic view that would accommodate richer empirical realities. The study argued for a recognition of the different levels of institutions that are relevant to the analysis of contract farming in a way that (1) traverses different scales to capture phenomena both at the farmer level and at the level of a contract farming 'domain', (2) incorporates substantively the heterogeneity of farmer types and farmer experiences with contract farming, and (3) incorporates dynamic elements of contract farming relationships, acknowledging the impact that continuity of these relationships into the future can have on economic decisions in the present.

This thesis thus made a case for analyzing contract farming as institution, as dynamic systems, where equilibria are maintained over a domain, advocating the Aokian Comparative Institutional Analysis framework as an appropriate theoretical apparatus to do this. Given the context of uncertainty, incomplete information and agents' constraints on rationality, contract farming emerges as frictional equilibria over a particular domain. Contract farming as institution then denotes a set of substantive characteristics representing agents' subjective expectations of a game and their choice of stable, procedurally rational actions within it. Individual choices among heterogeneous agents

then jointly determine the larger form and nature of the contract farming system that emerges, including relational elements to maintain the system.

If contract farming arrangements are frictional equilibria, it is important to modify the analytical frameworks that underwrite empirical work in economics. This thesis essentially argues for unraveling the principal-agent framework into its constituent stages, suggesting that the folding in or collapsing of these different constituents into a single theoretical model runs the risk of assuming away critical arena of action. In short, it advocates the development of a theory of contract farming that dismantles a composite problem into its different constituent stages, of contracting, of honoring agreed contracts and of contract enforcement. Each of these stages contains elements of friction that define the substantive features of the arrangement.

The thesis then applied this framework to examine contract farming practice in five different commodities in southern India, using survey data on 822 farmers, 42 agribusinesses, contract documents and secondary data as the basis of analysis.

Contrary to existing findings that contracting insures farmers against price risk, this study finds that farmers' subjective expectations of the returns from contracting versus the next best alternative indicate that contracting might be associated with higher mean returns but also higher variance. This is true across farmer groups, namely, those who contract as well as those who do not. Those who select into these systems presumably tolerate the higher variance as long as the mean returns are also higher, i.e., as long as it is a relatively safe gamble, while those not contracting presumably are averse to the higher variance in returns relative to the next best alternative. The survey also finds that even where returns from contracting first order stochastically dominates returns from the next best alternative, some farmers might be disinclined to take up contracting seemingly due to other risks that are difficult to monetize. Risk scores from a psychometric mapping of farmer perceptions of risk attenuating and risk exacerbating factors associated with contracting and the next best alternative show that, indeed, while the distribution of the ratio of subjective mean returns from contracting and not contracting was comparable across farmer groups, farmers who are not currently contracting tend to associate contract farming with higher net incremental risk than do contracting farmers.

The evidence suggests that farmers do have agency in the context of the emergence or sustenance of contract farming as institution, a feature not adequately acknowledged in existing contract farming research. In short, contract farming, like any technology with ambivalent impacts, could possess intrinsic elements that trigger disadoption or prevent adoption and the mortality of schemes could well be due to such endogenous factors. Furthermore, contract farming arrangements could, in the minds of farmers, also be associated with catastrophic risks, like perceived risk of losing title to land, of impacts on human health and soil quality, prompting certain farmers to opt out of these arrangements, despite perceived benefits.

Notwithstanding farmer agency in participating in contracting arrangements, firms are selective in choosing from among a pool of willing farmers, typically offering take it or leave it contracts. A contracting firm's problem is to identify a portfolio of farmers with whom to contract, making sure that their individual rationality constraint is satisfied. The firm seeks to minimize the costs of transacting while also minimizing the risks of non-delivery. This study makes the case for treating the entire domain of the contracting scheme as relevant to the firm's choice of farmers, suggesting that firms often choose geographies for procurement, sorting regions before choosing from among heterogeneous farmers. In each of these elements, imperfect and incomplete information on farmer reliability and abilities introduces friction. Empirical evidence suggests that such geographic sorting is relevant and ignoring this aspect could lead researchers to misidentify drivers of selection.

As for welfare gains, it is evident that contract farming could potentially increase net profits substantially for participating farmers. This could however differ substantially across commodities and be variable over time, and the results presented here reflect the timing of the survey and the nature of alternatives compared. This study finds that contracting in papaya and broiler are associated with improvements in net profit per month of for those participating and potential improvements of 47% and 123% for current non-participants. While for gherkins and marigold this does not seem to be the case, it appears that contracting could be offering other benefits that are not reflected in these measures. Also, this result overturns when the benefits are computed for the entire group of pooled controls rather than for commodity-specific controls.

In the context of India, a major source of friction in contracting arrangements is weak public

enforcement of contracts through the courts. Contract farming relationships in India are seen more as relationships and less as contracts, with formal enforcement mechanisms playing only a peripheral role in maintaining and supporting transactions. This is related only in part to the costs and inefficacy of formal enforcement mechanisms. Given that firms typically contract for small quantities from a large number of farmers, court-based enforcement does not usually make economic sense. In a case presented in this study, 37% of the contract farmers had some default; most of these were modest amounts. Depending on the costs of enforcement, the number defaulting farmers who can be taken to court without entailing a net loss for the firm, ranges from only 3% to about 25% of those who have outstanding dues.

More importantly, however, firms tend to view court-based formal enforcement as detrimental to farm-firm relationships in a way that undermines the handshake ethic. This latter concern drives firms to leverage relationships to support economic transactions, mixing formal and informal elements to do so, with considerable heterogeneity among the commodities. The space of contract farming then defines a 'moral' economy, where breach by both firms and farmers is pervasive, a large part of which is overlooked or excused in the interests of sustaining the system.

Interestingly even when contract price matches the spot market price, there is evidence of a fraction of the farmers sideselling. The Farmer Survey finds that the incidence of breach by way of sideselling farmers is 17% and 10% of contracting farmers reported that the firm had breached the contract the previous season. While personal relationships underpin these economic transactions for promoting contractual commitment and compliance, the study suggests that relationships necessarily work in tandem with price-based incentives. When the contract price offers enough premium over alternative prices, relationship-based incentives to improve contractual performance are ineffective since they are rendered irrelevant. When spot market prices far exceed contract price, relationships are inadequate and fail to induce farmers to honor contracts. Between these two ends, however, there exists a range of price differentials, where despite the incentives for breach implied by high market prices, the relationship can overturn or neutralize this influence and improve contractual performance. In short, there are limits to the role of relationships in defining a self-enforcing range of agreements, and this could differ across commodities. The manner in which

relationship farming operates alongside price-differential driven incentives for breach can differ thus significantly across commodities, illustrating that heterogeneity in the enforcement problems and strategies in contract farming practice.

12.2 Contract Farming and Public Policy

One of the major policy challenges in India has been that of providing institutional space for private sector participation in agriculture, especially via contract farming. While there are a number of ongoing efforts that are regarded as successful in increasing incomes of participating farmers, there is a popular perception that achieving scale has been a problem and that more needs to be done to promote contract farming.

This study yields a few insights for policymaking in India. It is evident that there are some critical bottlenecks that prevent scaling up of schemes, chief of which are enforcement problems. In general, farm-firm relationships can be fragile and fraught with friction. Enduring partnerships between farm and firm are difficult to build and to maintain these requires exceptional effort by the firm. Many firms have had to absorb large losses in order to build trust and persuade the farmer of the firm's commitment. Farmers are left especially vulnerable to the danger of firms reneging on their contract. Quite apart from enforcement issues, for the farmer, the relationship has to hold significantly greater rewards than alternatives they have and not expose them to a new set of risks. Evidence on farmer participation in contract farming schemes suggests that there are groups of farmers who systematically might choose not to participate, sometimes foregoing benefits from participation, on account of perceived risks. Whether or not the latter concerns are legitimate or not is a different question. From the firm's side, choice of procurement sheds often reflects a geographic or spatial preference, dictated in part by commodity characteristics and in part by their need to balance transactions costs and risks of procuring from one region rather than another. The welfare gains from participation tend to vary widely across farmers and schemes and are essentially stochastic, providing a catalyst for farmers and firms to revisit their contracting decisions periodically. This last feature implies farmer attrition could be high so that participation is time-variant with substantial farmer churning in a firm's portfolio of suppliers.

All these suggest that the instrumentality of contract farming in delivering technology, access to markets and finance or in enabling small farmers to take advantage of opportunities in high-value agriculture, although correct, is probably overstated. Contract farming cannot serve as a broad-based strategy for rural development (see also Minot (2008)), given the difficulties in sustaining contractual relationships and the equivocal impact of contract farming.

In this context, the notion that state agencies can be party to contracting arrangements, either as third party guarantors or even as the buy-back agency does not make sense and that approach does not entirely resolve all the concerns outlined above as constraints for the expansion of contract farming. The challenge is then to craft an array of policy instruments that responds to these realities. Fundamental to this is a recognition that the space of firm-farmer interaction is largely outside the sphere of influence of state policies. In a way, public policy should focus on the context of contract farming rather than on contract farming itself.

For example, weak enforcement mechanisms are prompting several Indian firms to take their contract farming operations to other countries in south-east Asia and Africa. Yet, establishing a single legal framework that provides for fair contracts and an effective redressal mechanism is unlikely to encourage formal contract farming. From a business standpoint, they face an expensive system that does not offer predicable dispute resolution and one that is prone to support farmers, at the same time crowding out the handshake ethic. Indeed, indications are that mandating state overseeing of private contracts might further informalize contract farming where firms end up pole-vaulting the law. Such interventions might therefore be ineffective, if not misplaced. Similarly, it is difficult for state policies to address farmer perceptions of risks associated with contract farming, given that these may vary widely across schemes and contexts. Efforts such as securing farmer titles to land and tenancy laws that protect land rights would rid farmers of the fear of losing land, for instance. These are however medium to long term measures. For other concerns, such as perceptions of impact on health or soils, these are likely not issues that policy can address effectively.

One potentially useful intervention could be establishment of information bureaus. Many firms in India share information on defaulting farmers and so forth to enable better selection of

farmers and perhaps to incentivize farmers to improve their record of honoring contracts. For the farmers, a comparable arrangement is largely absent and information flows are confined to social networks. An information bureau at the local level that maintains a record of the operations on the contracting firms in the region and structured feedback of farmers who have had a contractual relationship with these firms could be one way of disabusing farmers of misinformation and of helping farmers distinguish the good firms from unscrupulous operators. Such a repository of farmer experiences so that farmers can clarify the implications of contract farming and access information on other farmers' experiences might work better than mandatory state oversight over contractual relationships. This is not to suggest that public enforcement is irrelevant. Quasi-judicial bodies can offer mediation services and so forth, but are likely to have limited impact given the reluctance of parties to seek third-party intervention.

Second, if contracting firms choose regions while choosing farmers, the issue of geographic comparative advantage becomes relevant. There is a case to be made for enabling policies in specific areas that have an advantage for particular crop sectors, for two reasons. Presumably, in regions that agribusinesses see potential for contracting a particular commodity, some clustering of operations is already likely to occur, so that policy interventions merely contribute to consolidating a trend. That said, promoting contracting clusters would have to be deployed judiciously, where it might reinforce negative trends, for example, when there are known consequences of contract farming such as degradation of soils, etc. The other possibility that supporting clusters offers is to ensure competitive conditions in a limited way. In clusters, which necessarily involves multiple firms procuring in the same region, farmers are less likely to be held hostage or left in the lurch by a monopsonistic firm. While there is a danger of collusion, this situation holds the best prospect for a balance in power between farmer and firms. As the example of gherkins showed, competitive conditions with multiple firms in the region meant, despite possible collusion on pricing, that each firm at least match the other's price and has an incentive to honor the terms of their contract if they are to continue contracting with the farmer.

While the above implies that the state focus efforts to promote contract farming in areas that are already favorably positioned, it goes without saying that public policy should focus sharply on

zones that are excluded by agribusinesses. This cannot be overstated. Indeed, a recognition that there might be geographic poverty traps where sustainable contracting for commercial agriculture by firms is unlikely or infeasible is critical, so that the idea of promoting contract farming does not crowd out special attention to disadvantaged or excluded regions. For these regions, more traditional forms of state engagement with agriculture, through the provision of public goods like irrigation, infrastructure and so forth, would likely be more appropriate.

This is the sense in which it might be possible to negotiate the seemingly polar normative consequences of contract farming, and to identify ways to ensure that the benefits of contract farming filter through without its costs.

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Appendix A

The Farmer Survey: Design and Implementation

A.1 Survey Design

The geographical focus of my study is an area representing seven (of the thirty-two) administrative districts of Tamil Nadu - Coimbatore, Nilgiris, Salem, Erode, Karur, Dindigul and Madurai. Within this area, the sampling frame comprises only those regions that are regarded as rural according to the definition of Census 2001.[1]

The *first stage units (fsu)* for the survey are sub-district administrative units called blocks. The *second stage units (ssu)* are sub-block administrative units called gram panchayats or Panchayat Village. A Panchayat Village typically constitutes one or more constituent villages, and represents the local village administrative body, with elected representatives. Its constituent villages might themselves comprise one or more hamlets, settlements or habitations. So, I refer to these within-Panchayat Village villages as hamlets, rather than villages, to avoid confusion. For the purpose of this survey, the second stage units or ssu are gram panchayats or Panchayat Villages, with the hamlets being the *third stage units (tsu)*. The *ultimate stage unit (usu)* is the household, also defined as per the census of 2001, which characterizes a household as a unit of members who usually eats from the same kitchen. The households that populate my sampling frame are farmer-households or households where there is at least one farmer. The farmer and, hence, the household, would necessarily be involved in agricultural activities, whether as main workers or marginal workers. I do not restrict the sample to landowners, so that tenant households[2] also figure in the population.[3]

[1] This excludes urban areas which are defined as (a) all places with a municipality, corporation, cantonment board or notified town area committee, etc. b) A place satisfying the following three criteria simultaneously: i) a minimum population of 5000; ii) at least 75 per cent of male working population engaged in non-agricultural pursuits; and iii) a density of population of at least 400 per square kilometer or 1000 per square mile.

[2] In some of these districts, prevalence of tenancy is very low.

[3] For the purpose of this survey, a farmer is defined in accordance with the National Sample Survey Organization of India, as a person who operates some land and is engaged in agricultural activities during the last 365 days. Thus, a person qualifies as a farmer if (i) s/he possesses some land (i.e. land, either owned or leased in or otherwise possessed), and (ii) s/he is engaged in some agricultural activities on that land during the last 365 days. By agricultural activities

The key factor is that the household must make cropping decisions, so that they determine what to grow. Agricultural laborers are therefore excluded, since they do not make cropping decisions. In short, I work with any rural household, whose member(s) has/have engaged in agricultural activities in the past 365 days.

To establish the sampling frame, I use a combination of exogenous and endogenous attributes. My choice of administrative districts is exogenous, for instance, driven by considerations of what is practical and appropriate for the study. In the initial phase of the project, I started with a longer list of candidate regions within India, but settled for interior Tamil Nadu, for the wide prevalence of functioning contract farming systems over a contiguous zone, and for my familiarity with the region and language. The number of contract farming schemes in operation over this region enables me to reach for something beyond a case study, while allowing me to tackle the issue of heterogeneity across schemes and sub-regions, given a shared administrative system. The procedure to identify farmers to interview is however endogenous stratified sampling, and in the context of this study, can be regarded loosely as choice-based sampling, since the fact of a cultivator-household contracting is the outcome of a match between the farmer wanting to contract with the firm and vice versa.

The first step was to contact the five firms I study, contracting in gherkins, cotton, marigold, papaya and broiler, to obtain a comprehensive list of the farmers they contracted with within the past one year (i.e., 365 days) in the study area.

I label those in this list as Contract Farmers (CF), also referred to as Subject Contract Farmers in the text. Some of the CF might have contracted twice that year, but that does not have a bearing in this survey design. In this study, therefore, a Contract Farmer refers to the head of an agricultural household (a household with at least one farmer) who has contracted for one of the contract commodities selected, with the corresponding firm, for at least one season in the 365 days preceding the date of my securing the list from the Firms. This is a very specific definition that must inform the interpretation of results from any analysis in the project. For convenience, I use "currently contract" as a substitute for contracted during at least one season in the past 365

is meant the cultivation of field crops and horticultural crops, growing of trees or plantations (such as rubber, cashew, coconut, pepper, coffee, tea, etc.), animal husbandry, poultry, fishery, bee-keeping, vermiculture, sericulture, etc. Those who have left the operational holding fallow in the reference period are included in the survey, irrespective of whether it was of their own accord or due to natural events.

days. I use Contract Farmer (CF) to mean households that engage in contract farming or contract households.

The list of farmers as given by the contracting firm identifies the hamlet of the farmer's residence. The second step was to separate hamlets in the region where the company currently contracts (CHs) from those hamlets where the company does not currently contract (NCHs). The Panchayat Village to which the contracting hamlets belong to, I designate as Contract Panchayat Villages (CV), and those to which the non-contracting hamlets belong, I refer to as Non-Contract Panchayat Villages (NCV). It is possible, for instance, that in a CV, there might be hamlets where the company does not currently contract. But it is always true that hamlets in a NCV do not currently contract.

At this point, it is important to distinguish the notion of Panchayat Village from a revenue village or census village. The latter two refer to boundaries that are captured as a unit for the purpose of revenue records and constitute the 'village' that is captured in the decadal Census of India. While the Panchayat Village and revenue or census villages coincide broadly, they do not match up precisely. At the level of the revenue villages (or census villages) I have detailed data on village level facilities. These are matched up with the respective Panchayat Village, so that it would be possible to distinguish CHs and NCHs on the basis of village facilities.

Working with this, I move up the geographical and administrative scale and designate Blocks that have at least one CV as Contract Blocks (CB) and those Blocks that have none as Non-Contract Blocks (NCB). So, essentially, within the districts of the study area, I am able to map the procurement shed of the contracting firms, dividing the administrative units into Blocks where they source, and within these Blocks, the Panchayat where the firms source and within the Panchayats, the hamlets from where the subject contracting firms source produce. In general, the contract hamlets and villages of the different firms do not overlap, and this was by accident not by design.

The CV, CB, CH are all subscripted for a commodity, and are always defined with respect to a specific contract commodity. A CB for cotton could therefore be NCB for gherkins.[4]

With this mapping, I develop a stratified sampling procedure (Figure A.1). I selected randomly Contract Blocks (CB). Within CBs I selected Contract Panchayat Villages (CV). Once I have

[4]This particular feature enables me to expand my sample so that a CB for cotton, for example, can serve as NCBs for all other contract commodities in this study, and so forth.

selected randomly the CPV that constitute the sample panchayats, I selected all the contracting hamlets (CHs) there and conducted a houselisting of all cultivator-households. In the houselisting process, I collected information that enables me to map the contract participation pattern at the hamlet level. Specifically, it enables me to do two things (1) to verify that the CF have indeed contracted with the subject firm for at least one season within the past 365 days and (2) to partition the non-CF (those who are not currently contracting) into categories that are relevant for the study, and examine the nature of non-participation and classify $(CF)'$ in ways that can provide useful insights.

The $(CF)'$ in this case is partitioned into three categories. The first category is called Other Contract Farmers (OCF). These are farmers who have in the past 365 days of the houselisting, grown the contract crop but have either contracted with a firm other than the particular firm that I have chosen to study or have opted to use some other market channel for their crop. The second category of $(CF)'$ is the sometime contract farmer or Attrition Farmer (AF) to denote that although not currently contracting, these farmers have, during some season in the past, before the past 365 days, contracted with the sample firm. These farmers have either passed up (or have been denied) an opportunity to continue being CF after an initial contracting relationship. These represent the farmers who have attritioned. Whether they will reclaim that status or not (that is, whether their AF status is temporary) was not assessed at the time of houselisting. The third and final constituent of the non-CF group is the Never Contracted Farmers (NCF). These are farmers who have never contracted with the contracting firm in the past and have never grown the contract crop. These farmers represent excluded farmers, having never been engaged in the contract-based supply chain, so to speak, of any of the five contract commodities, with any firm or trader in the region.[5]

While houselisting, all farmers were asked if there were crops other than the contract commodity, for which they were engaged in contracting relationships. This was to provide insight into the degree of contractual marketing relationships in the community. While this information did not

[5]There is a residual category of farmers who contracted in the past with firms/channels other than contract firms included in this study, but ceased to do so. I include them as AF in the houselisting process, but did not sample these farmers in the survey, since the focus of the study was attrition from the study firms and not of any firm in general. So, these farmers are not represented in the final survey.

Figure A.1: Sampling Scheme for Farmer Survey

Stage of Selection	Sampling Unit	Contract Region										Non-Contract Region		
Spatial Selection Stage	Block (fsu)	CB										NCB		
Spatial Selection Stage	Panchayat Village (ssu)	CV							NCV			NCV		
Spatial Selection Stage	Hamlet (Houselisting Level) (tsu)	CH				NCH			NCH			NCH		
Matching Stage	Farm Households (Sampled from Houselist) (usu)	CF	OCF	AF	NCF	OCF	AF*	NCF	OCF	AF*	NCF	OCF	AF*	NCF

***If contracting firm operated here before reference period.**

*If contracting firm operated here before reference period.

enter sampling considerations, they provide information on the spread and depth of commercial agriculture in the region.

Within the CVs, I include all the hamlets that contracted. In all cases, I selected at least one NCH in the CV. I did not select NCBs, based on the pilot survey, since the questionnaires did not elicit responses about perceptions of contract farming in a way that I would be able to use to make comparisons.

This approach to sampling enables me to do two things. First, it would be possible to address a particular contract farming scheme as a case study, in the way several studies do. Second, it enables me to transcend a particular contract farming scheme as a unit and capture the broader domain, so that it is now possible to document and comment on the extent of contracting over the chosen domain: what are the inroads contract farming has made, in what crops and what is the socio-economic-demographic profile of areas where there is high prevalence of contracting? Thus, with this approach, I can examine the phenomenon of contract farming at two levels,a domain-level mapping, and a higher-resolution view of the contract farming relationship within each scheme.

A.2 Sampling in Practice

While the intended sampling procedure was tight on paper, its implementation in the field was not without problems, some of which were difficult to resolve. For instance, the sampling procedure

presumed that I would be able to identify Contract Blocks (CB) and Contract Panchayat Villages (CV) neatly. An initial cross-check of whether the firms really contract in the villages on the list revealed discrepancies. It turns out that the firm's idea of the village is notional and does not conform to administrative boundaries. Firms (i.e., the field officers) seemed more comfortable talking about regions they procured from rather than formal administrative boundaries. For instance, the firm had classified a bunch of villages under Tuvarankurichhi block (in Tiruchirapalli District). On verification, most of these villages were, in fact, part of Melur block, Madurai District. Consequently it was difficult to map the company's list of farmers' hamlets with the ones I could identify on the official roster at the level of the district administration. Also many Panchayat Villages have constituent hamlets that share the same name as the one on the company list, so it was a huge endeavor getting these clarified. Further some of the CVs straddle boundaries. In one village, a street separates the Kerala part of the village from the Tamil Nadu part. Owing to these problems I spent much time reclassifying Contract Panchayat Villages (CVs) correctly.

The selection of usu was fraught with similar problems. It is often the case that the same family (household) contracts under the name of different members of the family in different years. I have accounted for these by running the farmer list through field officials who were able to identify members of the same family, so that each household is counted as one, and not each member (so a contract or non-contract household is what counts, unless the members have separate titles to land).[6]

The other problem was that there were farmers the company claimed they had stopped contracting in, who claimed that they had sown gherkins, for instance, for the firm that season. So there were Contract Farmers (CFs) in Non-Contract Villages (NCVs), which was not supposed to be possible in my sampling strategy. This was only true of one village. In this case, I dropped the village and replaced it with another sample village, randomly selected from the candidates. The other issue was an inexplicable reluctance on the part of farmers to pronounce their true contracting status. Other farmers were aware of the field official they interacted with but not the firm the field official was representing. In short, even at the houselisting stage, I was not sure of the contracting

[6]This occurred only in one case, where brothers had separate titles to land, had separate contracts with the firm. They were counted as two households.

status of a particular farmer. This difference between the formal claims made by the contracting firms and the farmers meant that considerable effort was spent in clarification in order to reduce mistakes in sampling. Despite difficulties, there is reason to believe that the eventual survey has been rid of these problems, given the considerable effort to clarify the details that were murky.[7]

Table A.1 describes details of the numbers sampled and the total number of those captured in the houselisting process. For gherkins, I select three CBs, within each of which I randomly select two CPVs. Within each CPV selected, I include all CV (or contract hamlets). Apart from this I select randomly one NCPV from within one of the selected CB. The selection of marigold contract farmers was done in a similar way.

For the cotton contracting scheme, sampling was more complicated. Since the 76 contract farmers in the scheme were thinly spread over about 19 villages, I had to opt for a sampling procedure that would keep the number of survey villages small. Doing a houselisting in too many villages would have been impossible given the resources at my disposal. So I arranged villages by descending order of number of contract farmers and went down the list to choose the first N villages that would get me 60 observations of contract farmers. I ended up with seven villages. I chose one village, randomly selected from the where no one contracted for cotton. So here the probability that a contract village was selected was proportional to the proportion of contract farmers in the village. In the case of papaya and broiler, too, contract farmers were relatively thinly spread over many villages. Here too the sample farmers were selected from among the hamlets where the highest concentration of contract farmers were present.

It must be noted further, that all those in $(CF)'$, in general, may not contract at all for the crop that is of interest, i.e, the chosen contract commodity, but could be contracting for another "non-contract" crop.[8] This information is available from the Farmer Survey and houselisting process.

[7]This was achieved by asking several people in the village and cross-checking with the firm headquarters and the field officials.

[8]This is to suggest that the sample I eventually work with might be representative of the contractees with respect to a firm, but I cannot make any general comment about contracting versus non-contracting, although I do use these categories in the context of assessing welfare gains.

Table A.1: Farmer Survey: Sampling numbers and framework

Commodity/Scheme	**Districts**	**Number of blocks**	**Number of villages**	**Number of hamlets**	**Subject Contract Farmers (CF)**	**Other Contract Farmers (OCF)**	**Attrition Farmers(AF)**	**Never Contract Farmers(NCF)**	**Scheme total**
	District	Number of Blocks	Number of villages	Number of hamlets	Contract Farmers	Other Contract Farmers	Attrition Farmers	Never Contract Farmers	Scheme total
PHASE 1: 2008-09									
Gherkin	Dindigul, Madurai	3	6	14	40	58	40	60	198
Cotton	Coimbatore	2	5	8	60	6	32	52	150
Total (Phase 1)		5	11	22	100	64	72	112	348
PHASE 2-2009-10									
Gherkin	Dindigul	3	4	7	54	23	18	21	116
Marigold	Erode, Coimbatore	3	8	15	59	24	18	20	121
Papaya	Erode, Coimbatore, Dindigul	8	12	19	72			27	99
Broiler	Erode, Coimbatore	12	35	47	61	10	10	57	138
Total (Phase2)		23	59	88	246	57	46	125	474
Grand Total					346	121	118	237	822

[1] Farmer Survey, Phase 1, 2007-08, Phase 2,2009-10.
[2] The district names are as in the census, 2001.
[3] The total number of farmers interviewed were 840. However, owing to either the quality of data, namely, inconsistent responses or too many missing responses, eighteen were dropped from the analysis.

A.3 Structure of Questionnaires

For the survey, I use distinct questionnaires reflecting the sampling strategy and the composition of farmer-types in the study, namely, Subject Contract Farmer (CF), Other Contract Farmer (OCF),Attrition Farmer (AF), Never Contract Farmer (NCF). For the five commodities, therefore, twenty different questionnaires were designed for the survey. Each questionnaire captures the three empirical aspects of interest in this study, as also contracting history, the subjective expectations of price, yield, profits of the contract crop and potential alternatives. Questions on the relationship with the firm attempt to capture farmer perceptions of the firm-farm interface and issues relating to enforcement. The questionnaires were coordinated so that they are similar across the crop sectors or contract farming schemes. The questionnaires were designed so as to be able to pool the farmers together for the analysis, and to allow for extensions to other crop sectors or contract farming schemes, if necessary. The differences arise only where the nature of the scheme or the crop introduces unique aspects that are of interest.

I also conducted unstructured discussions with selected residents (progressive farmers, village heads, as well as marginal farmers) in the sample villages surveyed in order to get a flavor of perceptions of contract farming at large and the predicament of cultivators in the region, given the larger context of 'agrarian distress' in India. In particular, I am able to gauge the history of contract farming practice in the region, as remembered by villagers. In a limited way, I was able to get ascertain the relevance of the secondary data, from the census, on village level facilities.

All the questionnaires were prepared in Tamil, the language of the interview with farmers, so as to minimize the errors that could crop up with impromptu translation by investigators. They also incorporate the regional inflections of Tamil in say, Dindigul and Coimbatore, which can be quite distinct. The questionnaires attached are English translations of the same.

The Survey Procedures were approved by the Institutional Review Board for Human Participants in Cornell University (via Protocol 08-02-092) on July 16, 2008. In keeping with the assurance of anonymity I provided the farmers, throughout the study, I withhold the details of the farmers interviewed and their location. Similarly, the precise time of the survey is not disclosed to ensure anonymity, since the identification of the time of the survey could be a possible way to identify

contracting villages that have been selected for the survey. Similarly, I do not name the firms involved in the survey in order to maintain their anonymity.

A.4 The Survey

The Survey was conducted in two phases. Phase 1 pertains to cotton and gherkins and was conducted in 2007-08. Phase 2 includes marigold, broiler, gherkins and papaya and was conducted in 2009-10. The field survey in Phase 1 was supported financially by a Junior Research Fellowship (JRF) from the American Institute of Indian Studies and the Ithaca First Presbyterian Church International Student Fellowship. Phase 2 was supported by a USAID-Borlaug LEAP Fellowship and the International Food Policy Research Institute (IFPRI)-New Delhi Office.

A.4.1 Phase 1

The questionnaires for Phase 1 were pretested in a Pilot Survey of 50 farmers in 4 villages in Tuvarankurichi Block in Tiruchirapalli district. The Survey was conducted between July 2008 and December 2008 with the assistance of graduate student investigators from three city colleges in Tiruchirapalli. A three-day training programme ensured that they understood the aims and objectives of the study and were able to interpret the questions in the manner intended. The training included interview techniques with role play and visits to the field. I either conducted or was present during a majority of the interviews conducted in the survey.

A.4.2 Phase 2

The questionnaires for Phase 2 were pretested in a Pilot Survey of 25 farmers in 2 villages in Karamadai Block in Coimbatore district. The Survey was conducted between July 2009 and December 2009 with the assistance of graduate student investigators from the Tamil Nadu Agricultural University (TNAU) in Coimbatore. A one-day training programme preceded the survey. During Phase 2, I was present for only a small proportion of the interviews conducted.

A.4.3 Triangulation and verification

From the perspective of the goals of the study, some critical pieces of the survey data needed verification and confirmation. Wherever there were gaps in the questionnaire or clarifications regarding farmer responses, it was possible to return to the farmers that very day to secure these. A daily editing process of questionnaires filled that day enabled this.

In other cases, I resort to a triangulation method of verification. For instance, the survey collects the prices that farmers expect to obtain for different agricultural products and those that they recall having obtained in the past season. This is a critical piece of information. So, to ensure that farmer responses were not bizarrely different from what really happened, I was able to check with the prevailing market prices in the nearest wholesale market for the particular produce. Where it pertained to crops, such as gherkins, that did not have a local market, I was able to verify the broad range of prices from a number of firms other than the one I had selected for the study. This was necessary since in many villages, implementing the interviews was a challenge given farmer reluctance to answering questions on contract farming. Wherever the contracting firms had given me transactions histories of farmers, going back four to six seasons (spanning two years), this provided another way of verify the reliability of the data collected through the survey.

In general, the costs and returns data collected from the farmers pertain to the most recent season of cultivation. The proportion of farmers who maintain written records is very low, so most of the data so collected was based on recall. I do believe however that these data are reliable owing to the timing of the survey, which followed the harvest period closely and the fact that farmers in this region were able to be very precise with the different components of cost and returns.

A.5 Supplementary Data

The survey data are paired with secondary data from different sources in order to contextualize the operation of the contracting schemes. I have stitched together available secondary data for the nine study districts comprising 2714 villages. These include around 141 variables covering details of village amenities, i.e., locational attributes, infrastructure, communication, irrigation, finance and

social development infrastructure. Also available is the socio-demographic profile of these villages. The data pertains to 1999 in some cases and 2001 in others. Despite the fact that it is not the most recent, the assumption is that it can faithfully capture differences in village level facilities for the purpose of the study. This data is collected as part of the decadal census. Since the census reports these facilites for revenue villages, two steps are essential before this data becomes useful for the current study. The first involved mapping the census villages to the panchayat villages, so that the revenue villages in the Census correspond to the Panchayat Villages, the unit of analysis relevant to the Farmer Survey. The second step is to map hamlets to their constituent Census or revenue village. This matching then enables me to assign to hamlets the corresponding village level facilities. This matching is not readily available to the researcher and required considerable effort.[9] In all, there are over 18000 hamlets belonging to the 2714 census villages.

The other important secondary data I assemble are the traded prices in the relevant alternate market of the contract commodity over the course of the study period. Where available, I also extract the volumes traded in the alternate market to gauge roughly the relative importance of contracting. For cotton, the prices are of the closest related variety to contract cotton in the Annur market, the largest wholesale market relevant to the contracting hamlets. For marigold, it refers to the Mettupalayam and Coimbatore markets. For gherkins, there exists no alternate market. For papaya, I obtain the price for the only other variety that is grown on a large enough scale at Oddanachatram market in Dindigul. These constitute daily prices; typically, the minimum, maximum and modal traded prices are recorded. These are wholesale prices, and not farmgate prices, which are likely to be lower than the former on account of transport costs and commissions.

[9]Efforts are on by various departments of the Governement of India and the state government of Tamil Nadu to match this data and enable researchers access a harmonized system.

Appendix B

The Agribusiness Survey

The Agribusiness Survey constitutes interviews with 42 different agribusinesses involved in contract farming in India across crop sectors. This Survey was meant to provide a macro perspective, an institutional view of the emergence of contract farming in India at large. It is therefore independent of the Farmer Survey, although it captures similar themes and issues. A goal of the Agribusiness Survey was to integrate within the particular study, perspectives of the firm, just as the Farmer Survey would capture the perspectives of the farmer.

A survey of agribusinesses involved in contract farming poses significant challenges in the context of India. First, there exists no comprehensive roster of firms who are involved in contract farming. Those included in the Annual Survey of Industries (ASI) do not all practice contract farming and all those who do, are not necessarily accounted for transparently in the the ASI. In the absence of a well-defined universe, I extracted lists of contracting firms from the Ministry of Agriculture's website and constructed a list of firms mentioned in the popular press in English during 2006-07. I also contacted industry associations for similar information. With this assembled list, I approached the firms. Several had ceased to exist and many had stopped contract farming operations. A few denied they were involved in contract farming and many dodged my repeated requests for interviews. Those who offered me an appointment also volunteered information of other firms contracting in the region or in the same commodity sectors as them and this enabled me to identify, via this snowball technique, a fairly representative set of firms that have or had had some form of contract procurement.

Most sample firms demanded confidentiality and a subset of them shared contract documents on the condition of confidentiality. Over the span of a year and a half, I interviewed one or several members of these firms, traveling across India to do so. The commodities represented in the sample

include staples like wheat, paddy and others such as gherkins, coconut, soybean, medicinal herbs, sugarcane, potato, biofuels (jatropha), baby corn, organic products, horticulture and broiler,etc. The geographies of their operations straddle the southern states of Karnataka, Andhra Pradesh, Kerala and Tamil Nadu, the north-west and central belt of Punjab, Rajasthan, Madhya Pradesh and Maharshtra, with a few from the east, like Jharkhand and West Bengal. The firms include sole proprietorships as well as large conglomerates and multinationals.

The survey involved informal structured discussions focused on the scale and mode of operations of the firms, the history of their experience with contracting, the policy environment, challenges and future plans. This study uses information acquired through these conversations and the contract documents as qualitative data.

Appendix C

Derivation of the log likelihood function for endogenous switching model

The log likelihood function is derived as follows:

$$
\begin{aligned}
L &= \Pi_n^{i=1}[f(Y_i|I_i=0)\Pr(I_i=0)]^{(1-I_i)}[f(Y_i|I_i=1)\Pr(I_i=1)]^{I_i} \\
lnL &= \sum_{1=1}^{n}\Big\{(1-I_i)[ln\phi(\frac{u_{2i}}{\sigma_2}) - ln(\sigma_2) + ln\{1-\Phi(W_i\frac{\alpha}{\sigma_v})\}] + I_i[ln\phi(\frac{u_{1i}}{\sigma_1}) - ln(\sigma_1) + ln\{\Phi(W_i\frac{\alpha}{\sigma_v})\}] \\
lnL &= \sum_{1=1}^{n}\Big\{(1-I_i)\Big[ln\phi\Big(\frac{u_{2i}}{\sigma_2}\Big) - ln(\sigma_2) + ln\Big\{1-\Phi\Big(\frac{W_i\frac{\alpha}{\sigma_v} - \rho_2\frac{u_{2i}}{\sigma_2}}{\sqrt{1-\rho_2^2}}\Big)\Big\}\Big] + \\
&\quad I_i\Big[ln\phi\Big(\frac{u_{1i}}{\sigma_1}\Big) - ln(\sigma_1) + ln\Big\{\Phi\Big(\frac{W_i\frac{\alpha}{\sigma_v} - \rho_1\frac{u_{1i}}{\sigma_1}}{\sqrt{1-\rho_1^2}}\Big)\Big\}\Big]
\end{aligned}
$$

Since u_{1i} and v_i are not independent,

$$
f(v_i|u_{1i}) \sim \frac{1}{\sqrt{1-\rho_1^2}}\phi\Big(\frac{v_i - \rho_1(\frac{u_{1i}}{\sigma_1})}{\sqrt{1-\rho_1^2}}\Big)
$$

$$
\begin{aligned}
f\Big(Y_i|I_i=1\Big)\Pr\Big(I_i=1\Big) &= f\Big(Y_i|\tilde{Y}_i>0\Big)\Pr\Big(\tilde{Y}_i>0\Big) \\
&= \int_{-\infty}^{W_i\frac{\alpha}{\sigma_v}} f(u_{1i},v_i)dv_i \\
\int_{-\infty}^{W_i\alpha} f(u_{1i},v_i)dv_i &= f(u_{1i})\int_{-\infty}^{w_i\alpha} f(v_i|u_{1i})dv_i \\
f(u_{1i}) &= \frac{1}{\sigma_1}\phi(\frac{u_{1i}}{\sigma_1})
\end{aligned}
$$

Appendix D

Survey Questionnaires

As described in Appendix A, the survey data was collected through a set of questionnaires, unique to scheme and farmer type. They were designed keeping in mind the sampling profile and the structure of markets. For example, since gherkins has no alternate spot market, the gherkins growers in the sample were necessarily growing on contract with firms other than the subject firm. So, for gherkins, there is no questionnaire for the farmers who go for the spot market. In contrast, for broiler, it was possible to have growers supply to other firms in the area on contract or supplying to the spot market. There is a distinct questionnaire to capture each category. Accordingly, the following questionnaires were used

- 1(A) Gherkins Subject Firm Contract Farmer (CF)
- 1(B) Gherkins Other Contract Farmer (OCF)
- 1(C) Gherkins Attrition Farmer (AF)
- 1(D) Gherkin Never Contract Farmer (NCF)
- 2(A) Marigold Subject Firm Contract Farmer (CF)
- 2(B) Marigold Spot Market Farmer (OCF)
- 2(C) Marigold Attrition Farmer (AF)
- 2(D) Marigold Never Contract Farmer (NCF)
- 3(A) Papaya Subject Firm Farmer (CF)
- 3(D) Papaya Never Contract Farmer (NCF)
- 4(A) Broiler Contract Farmer (CF)
- 4(B) Broiler Other Contract Farmer (OCF)
- 4(BB) Broiler Spot Market Farmer (OCF)
- 4(C) Broiler Attrition Farmer (AF)

- 4(D) Broiler Never Contract Farmer (NCF)
- 5(A) Cotton Subject Firm Contract Farmer (CF)
- 5(B) Cotton Spot Market Farmer (OCF)
- 5(C) Cotton Attrition Farmer (AF)
- 5(D) Cotton Never Contract Farmer (NCF)

In this appendix, I include a set of questionnaires for just one scheme, gherkins and one questionnaire from marigold (for farmers who grow for the spot market) to represent the complete set of farmer types included in the sample. The questionnaires for all the schemes are the same, excepting minor differences to accommodate the particular nature of the commodity. For example, the cost and returns to broiler would have categories of costs that are quite different from field crops. Similarly, the questionnaires for papaya reflect the fact that the contract commodity is in fact latex and a tree crop. I also include the Oral Consent Transcript.

Survey on Contract Farming in Tamil Nadu
ORAL CONSENT TRANSCRIPT

Sir/Madam,

I am a student interested in agricultural operations of businesses that contract with farmers / contract farming in India. I am conducting a study of farmers, like yourself, in the Dindigul-Coimbatore region to understand issues relating to contracting. In particular I would like to learn about your experience contracting with "Name of Firm", the benefits, costs of doing so and problems you might be facing, in general, in carrying out your agricultural operations. I would like to interview you for this purpose. This would take about 40-45 minutes.

Taking part in this study is completely voluntary. If you decide not to take part I respect your wishes. If you DO want to participate but are busy now, let me know when it is convenient for you to spare the time. I will return then. During the course of the interview, you may skip any questions that you do not want to answer; you are free to withdraw at any time.

I would like to assure you that I am an independent researcher and have no links with the firm you contract with or any other firm or the local government. Our conversation today will be kept absolutely confidential and will be used only for the purpose of my research. I will note down what you say in the questionnaire I have here, and will ensure that this is not viewed by anyone else. It shall be kept locked and discarded after a few years, when I have completed my research.

I do not anticipate any risks to you participating in this study other than those encountered in day-to-day life. There are no benefits to you if you choose to participate in this survey.

If you have any questions regarding any aspect of what I have just said, do not hesitate to ask me now. Should you want to know more about my research, you can ask me at any time. I will leave my contact number with you after the interview. I will be here in your village all of today. If you have any questions or concerns regarding your rights as a subject in this study, I could put you in touch with the Institutional Review Board (IRB) at my University. They can be contacted by phone at 607-255-5138 or if you/you know anyone who can use the internet, you can access their website at http://www.irb.cornell.edu/.

I will proceed with this interview if you give your consent.

Sudha Narayanan

Schedule 1(A): SUBJECT/SAMPLE FIRM CONTRACT FARMER QUESTIONNAIRE

[Investigator: Interview the head of the farm household in the list of selected farmers. If the farmer is unavailable, do not interview anyone else in the household. Introduce yourself and explain the purpose of the survey. Make sure you convey all the points mentioned in the Oral Consent Transcript in the same words. Indicate the approximate time the interview will take. If the farmer has written records encourage him/her to refer to these, especially if the contract farmer has passbooks. Make sure the farmer has a chance to clarify his/her doubts and give consent before you start the interview.]

Name of the Investigator	Date of Interview	
FARMER ID: (Copy from the Sampling Sheet after verifying identity of the farmer)		
Hamlet	Panchayat	Revenue Village
Block	Taluk	District

A. LANDHOLDING, CROPPING PATTERN

1) *[Investigator: This is a confirmatory question*] What is the main occupation of your household in the last 1 year or 365 days?
   1) Casual Agricultural Labour
   2) Casual Non-Agricultural Labour
   3) Cultivation
   4) Other Self-employed
   5) Salaried employment
   6) Other (specify) _____

2) How much land does your household currently **operate?** (a)Owned _____ cents / acres / kuzhi
   (b) Leased _____ cents /acres /kuzhi

   a) What proportion of your land is irrigated? _____ %

   b) What is the **main** source of irrigation?
      1) Well
      2) Tubewell
      3) River
      4) Canal
      5) Rainfed
      6) Other (specify) _____

3) Compared to other farmers' lands in your village, would you say that the agricultural land you own is
   1) More fertile
   2) Equally (or just as) fertile
   3) Less fertile

4) What has been the cropping pattern ***this past year***? [*Investigator: Include land left fallow*]

	(A) Crop [Investigator: Include tree crops as well e.g., coconut, banana]	(B) Month of Sowing (for crops other than trees).	(C) Month of Harvest (for crops other than trees	(D) Area (in acres/centskuzhi) Note units	Quantity Produced (E) (Please note units)	Quantity Sold (F) (Please note units)	(G) Marketing Channel (See Code below)
1							
2							
3							
4							
5							
6							

1=Trader, 2=Pre-harvest Contractor, 3= Direct to consumer, 4= Contract (Intermediary), 5=Contract (Firm), 6=Self Consumption

B. SELECTION, INITIAL EXPERIENCE

You mentioned that you contracted for Gherkins with THE "FIRM" in the past season. We would like to know more about your experience.

5) When did you first become aware of the option of contracting Gherkins with THE FIRM? _____ _____

6) When was the first time you contracted with THE "FIRM"? (Specify month and year, e.g., Masi 2006) _____ _____

7) Had you ever cultivated gherkins before that? Yes / No

➔If **YES**,

a) How many years' experience did you have cultivating gherkins before you contracted with this FIRM? _____ years

b) What was the marketing channel you were using then?

1) Direct selling in the market
2) Trader / Commission Agent
3) Company (specify which company)_____
4) Other (specify) _____

8) When you began contracting, what were the reasons you decided to contract with THE "FIRM"?

9) Initially, how much hesitation did you have before going in for contracting with THE "FIRM"? [Investigator: Read out all options]

1) Hesitated a great deal
2) Hesitated a little
3) Had no hesitation

10) What were the reasons for feeling the way you did?

11) How did you first establish contact with the company to express willingness to contract with THE "FIRM"? [Investigator: Circle all relevant options. Read out options.]

1) A friend/neighbour/fellow-farmer/relative introduced me / put in a word for me
2) I contacted the company official /agent on my own
3) The company official/ agent approached me personally
4) The company official/agent was canvassing in the village and asked for volunteers
5) Others (please specify) _____

12) Were there any eligibility criteria that you know of in order to get selected by the firm? Yes / No / Unaware

i. ➔If YES, please list any eligibility criteria. Why do you think you were selected? [Investigator: Circle the appropriate response. Circle ALL that apply]

1	Faith	**8**	Through a group or through someone I know
2	Hard work and ability	**9**	Those who are interested
3	Reputation	**10**	Those who will pay the loan and are creditworthy
4	Those who will comply and obey	**11**	Under pressure from other villagers
5	Land	**12**	Crop experience
6	Good soil, well situated parcel	**13**	They take whoever they wish; it is arbitrary
7	Irrigation Facility	**14**	

13) What are the kind of preparations you had to make or investments you undertook **before** you could contract? (List all the expenses incurred on the same. E.g. tubewell, drip irrigation system, spraying machine, preparation of land, a shed for the birds, etc.)

S.No.	(A)Item	(B)How much did it cost? (in Rs.)	(C)How did you finance the investment? If borrowed, mention source e.g., SBI, friends, etc.
1			
2			
3			

14) Since you first began contracting with THE "FIRM", please give some details about your contracting history .

	Season and Year (A) [Investigator: Write Year within brackets]	Seeds Provided (in kgs) (B)	Acreage sown (in acres) (C)	Actual Production (in kgs.) (D)	Sold to the Company (in kgs.) (E)
1	First Year with THE "FIRM" (_____)				
2	Current Season (_____)				
3	The Last Season (_____)				

15) Since you began contracting, have there been years, when you did not contract with the firm even for one season? Yes / No

➔**If YES,**

i. When was the most recent year? _____
ii. The reason for the break?
   1) The company did not offer contract
   2) Contracted with another firm
   3) Sold in the spot market
   4) Losses with contract crop
   5) Pest issues
   6) Water issues
   7) Other (Specify) _____

16) Is it a written contract? Yes /No

➔**If YES**

i. Do you have a copy? Yes / No
ii. Is it valid in court? Yes / No
iii. Have you read it or had it read to you? Yes / No

17) Who do you have the contract with?
   a) The Firm
   b) An Agent
   c) Another Farmer
   d) Others (Specify) _____

18) Do you have contact with other farmers who pursue contract farming, in this crop or in other crops? Yes / No

➔**If YES,**

i. Which crops?

(1) Papaya (2) Gherkins (3) Marigold (4) Poultry (5) Other (specify)_____

ii. Are these

a) Relatives /family in your village
b) Relatives/family in another village
c) Friends in this village
d) Friends elsewhere
e) Acquaintances in this village
f) Other (Specify)_____

C. ELICITING EXPECTATIONS FROM THE CONTRACT FARMER

19) We would like to learn about your expectations regarding earnings and yield of **gherkins**. If you were to follow the same set of procedures, with the same firm and field officer, under the same contractual terms and assuming the general conditions in your family, village and weather are unchanged, out of 20 seasons growing the contract crop in a plot of your choice, which has the same qualities, what is the number of occasions you would attain the minimum/ the most likely / the maximum price/yield/net income per acre of the commodity?

Variable	Unit Please note unit Rs/kg, quintal./acre for yield, etc.	What is the **minimum** value you expect?	What is the most likely value?	What is the **maximum** value you expect?	If I give you these 20 tokens and ask you to give the most tokens to the number you have said is most likely, the next most tokens you think is the next most likely and the least tokens to the least likely.		
					Number against **Minimum** Value?	Number against the **most likely** value?	Number against **maximum** value?
Price (unit value) [Since gherkins has many grade, the focus here is on eliciting an average unit value as "price."]	Rs./kg.						
Yield	Kg./acre						
■ **Net Income**	Rs./acre						

[Investigator: Write number of tokens in the boxes. To check for their understanding, (1) they should at least assign a token to each of the three outcomes they earlier proposed and (2) the most likely outcome should have the most tokens]

20) What, in your opinion, are the most important risks and benefits associated with contracting? [*Investigator*: Please pay careful attention to this set of questions. This pertains only to **gherkins.** To start with **do not prompt**. Let the farmer mention the risks/benefits first. Once the box has been filled out, then read out the options the farmer has not mentioned to verify that they are not considered relevant by the farmer. If the farmer is reluctant to answer these set of questions, then try prompting with examples of attributes.]

Type of Risk/Benefit [investigator: The term used differs across regions, make sure you find out what term to use]	Is this risk/benefit present? [*Investigator: Let the farmer list the risks. If the farmer mentions a risk, write 1 against it, if not mark 0. Then move to the next column]*	How important do you think each of these risks/benefits is to your well-being? *[Rank on a scale of 0-10 with 0 means not important to you at all, 10 means it is extremely important to you.]*	What is the probability of the following event happening in contracting with THE "FIRM" *[If you contract 10 times how many times do you feel this event will occur.]*
Yield risk			
Price risk			
Risk of firm not coming back to pick up the produce at harvest time.			
Risk of delay in payment			
Risk of non-availability of credit			
Risk of non-availability of inputs			
Risk of poor quality inputs			
Risk of wrong technical advice			
Risk of rejection/downgrading of produce by the firm, quality			
Risk of the firm not coming to contract in the future			
Risk of losing land			
Others 1 (specify) _____			
Others 2 (specify) _____			
BENEFITS			
Inputs provided by the firm on credit			

Advance provided by firm			
Credit available against contract			
Technical advice available			
Lumpsum payment			
Timely payment			
Price fixed, certainty			
Reduced transaction time			
Assured buyer			
Positive yield risk			
Farm-gate collection			
Others 1 (specify) _____			

21) If you were not contracting for GHERKINS with the FIRM this season, what would be your next best option? [Investigator: Read the option aloud and get the next best alternative – the name of the company and/or crop.]

1) Gherkins contract for another company (specify the name of company/agent)_____

a. If this were not possible, what crop would you grow instead _____

2) Another crop instead of gherkins [Inv: Please note which crop the farmer would have cultivated] _____

[Investigator:The next set of questions focuses on the crop mentioned in 1(a) or 2]

D. RISK PERCEPTIONS OF ALTERNATIVES (ALTERNATE CROP)

22) Had you chosen this alternative option for the current season, if you were to follow the same set of procedures, assuming the general conditions in your family, village and weather are unchanged, out of 20 seasons growing the contract crop in a plot of your choice, which has the same qualities, what is the number of occassions you would attain the minimum/ the most likely / the maximum price/yield/net income per acre of the commodity?

Variable	Unit Please note unit Rs/kg, quintal./acre for yield, etc.	What is the **minimum** value you expect?	What is the most likely value?	What is the **maximum** value you expect?	If I give you these 20 tokens and ask you to give the most tokens to the number you have said is most likely, the next most tokens you think is the next most likely and the least tokens to the least likely.		
					Number against Minimum Value?	Number against the most likely value?	Number against **maximum** value
Price expectation							
Yield expectation							
■**Net Income**							

23) What other risks or benefits that you associate **with the alternate crop? [**Investigator: Same as for the previous risk/benefit table**]**

Type of Risk/Benefit [investigator: The term used differs across regions, make sure you find out what term to use] (A)	Is this risk /benefitpresent? [Investigator: Write 1 if YES, 0 if NO] (B)	How important do you think each of these attributes is to your well-being? *[Rank on a scale of 0-10 with 0 means not important to you at all, 10 means it is extremely important to you] (C)*	How frequently do you face this situation? *[In 10 seasons, how many times do you feel this event will occur? Note for those who are contracting for the first time, this is difficult.]*
(1)Risk of non-availability of credit			
(2) Risk of non-availability of technical advice			
(3) Risk of poor quality inputs			
(4) Risk of non-availability of inputs			
(5) Non availability of hired labour			
(6) Not finding a buyer			
(7) Delay in payment			
(6) Rejection of produce			
(7) Weather risk/ yield			
(8) Price risk, price drop			
(9) Others _____			
BENEFITS			
Positive Price Risk, price rise			
Can sell anytime, flexibility			
Quality is not critical			
Known trader in the market			
Positive yield risk			
Others 1 (specify) _____			

E. COST AND RETURNS FROM CONTRACT CULTIVATION & TRANSACTIONS COST [For this section, data should pertain to the previous contracting season.If the farmer is contracting for the first time and the harvest is not yet over, then fill in expected rates where actuals are not available, for e.g., for labour costs for harvesting, mentioning "E" for expected alongside the entry.]

24) Could you give some details of your costs and returns for the **last completed season**?

Operations	Labour Cost						Machine (hr)	Input/output		
	Male(days)		Female(days)		Labour cost for hired			Quantity	Unit price	Source (1=Purchased; 2=Owned: 3=Company Provided
	Hired	Family	labour Hired	Family	Male	Female				
Variable cost										
1. Land preparation										
2. Seed bed preparation										
3. FYM/Compost										
4. Planting/sowing										
5. Seeds										
6. Seed treatment										
7. Fertilizer application										
8. Micro nutrient application										
9. Interculture operation										
10. Weeding/weedicide application										
11. Plant protection chemicals										
12. Irrigation										
13. Harvesting										
14. Equipment repair and maintenance										
TRANSACTIONS COST										
15. Post harvest operations										
16. Packing and Sorting										
17. Transport to the Market/Collection Center										
18. Commission on transaction										
19. Interest on working capital @7%										
Fixed cost										
1. Land rent										
2. Depreciation on farm assets										
3. Interest on fixed capital 12%										
Total cost										
Main product yield										
By product yield										
Gross return										
Net return										

25) What is the volume of product rejected as not meeting quality standards? _____ kgs

26) What is the volume of product that was lost due to spoilage /wastage? _____ kgs

27) How many days did it take for you to receive full payment after completion of the transaction? _____days

G. ENFORCEMENT

28) In the last season, have you used the inputs for the contract crop for your other *non-contract* crops? Yes / No

➔If YES,

a. What is the proportion of inputs that you were given did you use for other *non-contract* crops _____ %

29) In the last season, have you sought or used the firm or agent's advice for your other crops? Yes / No

➔If YES,

a. Please explain _____

30) In the last season, has any other company approached you or have you sold the **contract crop** to any other buyer (local market or another company) Yes / No

➔If YES,

a. What proportion of the contract crop did you sell? (in %) _____%

b. What are the reasons you sold elsewhere? _____

31) According to you, what proportion of the contract farmers in your village or outside sell their contract crop to other buyers? _____%

32) How often do you think other contract farmers in your village sell the contracted crop to other buyers?

(1) Regularly (2) Frequently (3) Not so frequently (4) Rarely (5) Never

---

33) The last time you contracted or delivered the contracted commodity to the FIRM, was the price offered by other companies, on an average, higher or lower than the contract price? [Inv: Circle the relevant option and note down the two prices].

a) Contract price was lower
b) About the same
c) Contract price was higher

Contract Price (in Rs/kg.) Grade 1_____Grade 2_____Grade 3_____ Grade 4_____ Grade 5_____
Price of Competing Firm (in Rs./kg) .) Grade 1_____Grade 2_____Grade 3_____ Grade 4_____ Grade 5_____

34) Would you accept this FIRM's contract if it offered you a lower price than other FIRMS operating in this region? Yes / No / Unsure

➔If YES, how much lower can it be before you reject the contract? **(Inv.Get the amount for the smallest gherkin – that is the highest value that you noted above)**

Contract price can be Rs._____/kg lower / Unsure

➔If NO, how much higher would the contract price have to be above the competitor price for you to accept the contract? **(Inv.Get the amount for the smallest gherkin – that is the highest value that you noted above)**

Contract price should be at least Rs. _____/kg higher / Unsure

---

35) Since you started contracting, have you ever faced a situation where you have been <u>unable</u> to deliver the contracted produce at the required time and place? Yes / No

a. Please describe.

1. Weather related yield loss/ Natural causes/Water shortage
2. When I feel my profits might be harmed, or the firm does not give a good price for the output
3. Would never happen
4. When I am constrained for cash
5. Company delayed in coming /delays in payments
6. Could not meet quality standards

36) In general, how important do you think it is for you to honour the contract?

1. Extremely important
2. Quite important
3. Important
4. Not so important
5. Not at all important

37) If you were to violate the contract, what do you feel would be the consequences? [Investigator: Allow the farmer to articulate his/her thoughts, and if appropriate ask the questions below to get specific answers as a follow-up]

1	Nothing	7	Warn us
2	They will not pay our dues/ demand that we return the money	8	Take some appropriate action
3	Will go to court	9	Fight with us
4	Will approach the police	10	Complain to the village leader
5	Will tell on us to other companies	11	They will lose faith in us
6	Stop contracting with us		

38) In your experience with this company has there been an occasion when you felt they did not keep up with the terms of the contract?

Yes / No

a. If YES, please describe what happened and when _____

39) In general, If the firm does not honour the contract, what would you do? [Circle all valid responses. Multiple answers are allowed.]
   a) Nothing, what can I do? Powerless
   b) Depending on the problem, we will decide
   c) Go to court
   d) Approach the police
   e) Complain to the local authorities /police
   f) Stop Contracting with this firm, contract with other firms
   g) Will make a representation to them
   h) Protest won't harvest the crop
   i) Give up the contract crop
   j) Will not let the firm come into our village
   k) Demand Compensation, Lose faith
   l) Other (please Specify) _____

40) In general, how much power to voice your opinions do you feel in this relationship with the company? [Investigator: Read out all the options. Circle only one. If the farmer elaborates, note his/her response below]
   a) Very powerful
   b) Somewhat powerful
   c) Neither powerful nor powerless
   d) Somewhat powerless/vulnerable
   e) Completely powerless/vulnerable

41) How many times in the last **two weeks** did the agent visit your farm? _____

42) Today, how risky do you think contracting with THE FIRM is?
[Investigator: Rank on a scale of 0 to 10; 0 means no risk at all, 10 means extremely risky] _____

43) What, according to you, are the chances that the ***company stops contracting with you*** within the next three years?
(1) Almost certainly (2) Very likely (3) Somewhat likely (4) Unlikely (5) Not at all likely

44) Would you continue to grow the contract crop if you stopped contracting with this company? Yes / No

45) What, according to you, are the chances that ***you will want to stop contracting*** with this firm within the next three years?
(1) Almost certainly (2) Very likely (3) Somewhat likely (4) Unlikely (5) Not at all likely

46) For the next season, do you plan to bring more area under gherkins or less?
(1) Will increase area (2) Will maintain the same area (3) Will decrease the area (4) Have not decided yet

47) To what extent has participating in contract farming enhanced the economic well-being of your family?
   (1) To a great extent
   (2) To some extent
   (3) Neither enhanced nor diminished
   (4) Has diminished
   (5) Has diminished a great deal

[Investigator: Request the farmer to elaborate and offer examples for the above, e.g. start a non-farm business, or buy land, build a house, etc. and record them under Investigator Observations at the end of the Questionnaire]

48) Taken all together, how would you say things are for you these days: would you say you are: _____
[Inv: 1=Very Happy, 2=Pretty happy, 3=Not too happy]

I. SOCIO-ECONOMIC STATUS OF THE HOUSEHOLD

49) What is the age of the head of the household? _____years

50) How many members are there in your nuclear family? _____

a) Of these, the number of members in the age group 0-15 years of age? _____

51) What is your social group?
a) SC/St
b) MBC
c) OBC
d) Others (specify) _____

52) What is the education level you have attained?
1) Illiterate
2) Literate (below primary)
3) Primary (Class V complete)
4) Upper Primary Class (Class VIII complete)
5) Secondary (Class X complete)
6) High School (Class XII complete)
7) Others (specify) _____

53) What is the education level of the most educated member of the household?
1) Illiterate
2) Literate (below primary)
3) Primary (Class V complete)
4) Upper Primary Class (Class VIII complete)
5) Secondary (Class X complete)
6) High School (Class XII complete)
7) Others (specify) _____

54) We would like to know your asset position. Does the household own any of the following items? [Investigator: Write the number of pieces of the object if applicable and 0 if not applicable]

	ASSET TYPE	**Currently possesses (write Qty and units)**
a.	Radio	
b.	Telephone Landline	
c.	Mobile	
d.	TV	
e.	Watch	
f.	Pressure cooker	
g.	Bicycle	
h.	Scooter/ Motorcycle	
i.	Livestock	
j.	Poultry	
k.	Tractor	

55) What is your main source of light now? ___ _____
[Inv.:1=Kerosene; 2=Candle; 3=Electricity; 4=Electricity with inverter; 5=Solar energy; 6=LPG/biogas; 7=Battery (torch); 8=Diesel generator; 9=Other, specify_____]

56) What is your main source of heat for cooking now? _____
[Inv.1=Wood/charcoal; 2=Kerosene; 3=Electricity; 4= LPG/biogas; 5=Crop residues; 6=Other, specify_____]

57) What is your main source of drinking water? _____
[Inv: 1=River/canal; 2=Public well; 3=Public handpump; 4=Own handpump; 5=Own motorpump or other waterlifting devices; 6=Piped water; 7=Rainwater; 8=Water filling station; 9=Other, specify:_____]

58) What were your main sources of income in the **past one year** ? *[Attempt to get the value in Rs. If this is difficult or the farmer is vague about it, try to record the percentage of annual income from each source.]*
   a) Cultivation _____
   b) Wage labour in Agriculture _____
   c) Wage labour off farm _____
   d) Self Employment _____
   e) Transfers and Remittances _____

59) What proportion of household foodgrain consumption do you buy from outside (e.g. ration shop)? _____%

60) How much of outstanding debt do you have at the moment? Rs. _____

J. MEASURING RISK AVERSION AND AMBIGUITY AVERSION

Risk Aversion

61) You have the choice of (1) accepting Rs. 150 from us right now for sure. (2) Or alternatively, instead of the Rs. 150, we will toss a coin, if it is heads you get Rs.210 and if it is tails, you get Rs.90.

What would you rather choose to do? (write 1 or 2)	
Write amount _____	

Ambiguity Aversion

62) Now, we would like to offer you another chance to win. We would like to offer you Rs.150 through another game
Bag 1 contains 4 white balls and 6 black balls. You pick a ball. You will win Rs.150 if the ball you pick is white.
Bag 2 contains 10 balls. Some are white and some are black. I don't know for sure how many of each there are. You need to name one color. And you will win Rs.150 if you pick the ball of the color you name.

Which bag will you choose? (write 1 or 2)	
Enumerator: Please allow the respondent to pick a ball from his chosen bag	
The reward from this game is	

Lottery Price

63) Supposing you were offered a lottery ticket, where the prize is decided by a coin flip. You win Rs300 if Heads and 150 if Tails. What is the maximum you would be willing to pay for the lottery ticket?

Rs. _____

K. INVESTIGATOR OBSERVATIONS

64) LOCATIONAL ATTRIBUTES

a. Distance of the farmer's field from the collection point _____ metres

b. Distance of the farmer's field from the nearest metalled roadhead _____ metres

c. Distance of the farmer's field from the nearest market for contract crop _____ metres

d. Distance of the farmer's field from the nearest market for the **alternate** crop _____ metres

e. Distance of the farmer's house from the panchayat president's house _____ metres

f. Distance of the farmer's house from the main village cluster/centre of village _____ metres

65) House Type
1) Kaccha (Odu, mud)
2) Pacca (Cement brick)

66) How would you rate the economic condition of this household compared to other households in the village?
1) Among the poorest 20%
2) Poorer than average but not among the poorest 20%
3) About Average
4) Better than average but not among the richest 20%
5) Among the richest 20%
6) Unable to observe

MAKE NOTE OF ANY QUOTES, COMMENTS, OR INCIDENTS THAT YOU THINK ARE RELEVANT AND INTERESTING. PLEASE MAKE NOTE OF IT IN SOME DETAIL.

Schedule 1(B): NON-SAMPLE FIRM, OTHER FIRM FARMER /SPOT MARKET FARMER QUESTIONNAIRE

[Investigator: Interview the head of the farm household in the list of selected farmers. If the farmer is unavailable, do not interview anyone else in the household. Introduce yourself and explain the purpose of the survey. Make sure you convey all the points mentioned in the Oral Consent Transcript in the same words. Indicate the approximate time the interview will take. If the farmer has written records encourage him/her to refer to these, especially if the contract farmer has passbooks. Make sure the farmer has a chance to clarify his/her doubts and give consent before you start the interview.]

Name of the Investigator	Date of Interview	
FARMER ID: (Copy from the Sampling Sheet after verifying identity of the farmer)		
Hamlet	Panchayat	Revenue Village
Block	Taluk	District

A. LANDHOLDING, CROPPING PATTERN

1. *[Investigator: This is a confirmatory question*] What is the main occupation of your household in the last 1 year or 365 days?
    1) Casual Agricultural Labour
    2) Casual Non-Agricultural Labour
    3) Cultivation
    4) Other Self-employed
    5) Salaried employment
    6) Other (specify) _____

2. How much land does your household currently **operate?** (a)Owned _____ cents / acres / kuzhi
    (b) Leased _____ cents /acres /kuzhi

    1) What proportion of your land is irrigated? _____ %
    2) What is the **main** source of irrigation?
        1) Well
        2) Tubewell
        3) River
        4) Canal
        5) Rainfed
        6) Other (specify) _____

3. Compared to other farmers' lands in your village, would you say that the agricultural land you own is
    1) More fertile
    2) Equally (or just as) fertile
    3) Less fertile

4. What has been the cropping pattern ***this past year***? [*Investigator: Include land left fallow*]

	(A) Crop [Investigator: Include tree crops as well e.g., coconut, banana]	(B) Month of Sowing (for crops other than trees).	(C) Month of Harvest (for crops other than trees	(D) Area (in acres/centskuzhi) Note units	Quantity Produced (E) (Please note units)	Quantity Sold (F) (Please note units)	(G) Marketing Channel
1							
2							
3							
4							
5							
6							

1=Trader, 2=Pre-harvest Contractor, 3= Direct to consumer, 4= Contract (Intermediary), 5=Contract (Firm), 6=Self Consumption

B. SELECTION, INITIAL EXPERIENCE

You mentioned that you contracted Gherkins with THE FIRM in the past season. We would like to know more about your experience. [Here, the FIRM refers to the firm the farmer contracts with and **not** the SUBJECT OR SAMPLE FIRM]

5. When did you first become aware of the opportunity for contracting? (Specify month and year, e.g., June 2006) _____ _____

6. When was the first time you contracted with THE "FIRM"? (Specify month and year, e.g., June 2006) _____ _____

7. Had you ever cultivated gherkins before that? Yes / No

➔If **YES**,

1) How many years' experience did you have cultivating gherkins before you contracted with this FIRM? _____ years
2) What was the marketing channel you were using then?
   1) Direct selling in the market
   2) Trader / Commission Agent
   3) Company (specify which company)_____
   4) Other (specify) _____

8. What are the reasons you decided to contract with THE "FIRM"? [Investigator: Circle the appropriate response. Circle ALL that apply]

9. Initially, how much hesitation did you have before going in for contracting with THE "FIRM"? [Investigator: Read out all options]
   1) Hesitated a great deal
   2) Hesitated a little
   3) Had no hesitation

10. What were the reasons for feeling the way you did? [Investigator: Circle the appropriate response. Circle ALL that apply]

11. How did you first establish contact with the company to express willingness to contract with THE "FIRM"? [Investigator: Circle all relevant options. Read out options.]
    1) A friend/neighbour/fellow-farmer/relative introduced me / put in a word for me
    2) I contacted the company official /agent on my own
    3) The company official/ agent approached me personally
    4) The company official/agent was canvassing in the village and asked for volunteers
    5) Others (please specify) _____

12. Were there any eligibility criteria that you know of in order to get selected by the firm? Yes / No / Unaware
    i. ➔If YES, please list any eligibility criteria. Why do you think you were selected? [Investigator: Circle the appropriate response. Circle ALL that apply]

1	Faith	**8**	Through a group or through someone I know
2	Hard work and ability	**9**	Those who are interested
3	Reputation	**10**	Those who will pay the loan and are creditworthy
4	Those who will comply and obey	**11**	Under pressure from other villagers
5	Land	**12**	Crop experience
6	Good soil, situated well parcel	**13**	They take whoever they wish; it is arbitrary
7	Irrigation Facility	**14**	

13. What are the kind of preparations you had to make or investments you undertook **before** you could contract? (List all and the expenses incurred on the same. E.g. tubewell, drip irrigation system, spraying machine, preparation of land, a shed for the birds, etc.)

S.No.	(A)Item	(B)How much did it cost? (in Rs.)	(C)How did you finance the investment? If borrowed, mention source e.g., SBI, friends, etc.
1			
2			
3			

14. Since you first began contracting with THE "FIRM", please give some details about your contracting history .

Season and Year (A) [Investigator: Write Year]		Seeds Provided (in kgs) (B)	Acreage sown (in acres) (C)	Actual Production (in kgs.) (D)	Sold to the Company (in kgs.) (E)
1	First Year with THE "FIRM" (_____)				
2	Current Season (_____)				
3	The Last Season (_____)				

15. Since you began contracting, have there been years, when you did not contract with the firm even for one season? Yes / No

➔**If YES,**

i. When was the most recent year? _____
ii. The reason for the break?
1) The company did not offer contract
2) Contracted with another firm
3) Sold in the spot market
4) Losses with contract crop
5) Pest issues
6) Water issues
7) Other (Specify)

16. Is it a written contract?

➔**If YES**

i. Do you have a copy? Yes / No
ii. Is it valid in court? Yes / No
iii. Have you read it or had it read to you? Yes / No

17. Who do you have the contract with?
1) The Firm
2) An Agent
3) Another Farmer
4) Others (Specify) _____

18. Do you have contact with other farmers who puruse contract farming, in this crop or in other crops? Yes / No

➔**If YES,**

i. Which crops?

(1) Papaya (2) Gherkins (3) Marigold (4) Poultry (5) Other (specify)_____

ii. Are these

1) Relatives /family in your village
2) Relatives/family in another village
3) Friends in this village
4) Friends elsewhere
5) Acquaintances in this village
6) Other (Specify)_____

EXCLUSION MODULE

19. Did you ever contract with the SAMPLE FIRM? Yes / No

➔If YES,

1) Why did you eventually give up? Please elaborate. [Investigator: Allow the farmer to respond circle the appropriate choices.]

1	The firm stopped contracting in the village	11	Health Issues on account of contract crop
2	The firm refused to give contract to me, though they were contracting in the village	12	Soil Quality deteriorated
3	Too much labour required	13	I was unable to deliver as per contract
4	Losses / Not much profits	14	Inadequate /Improper advice by company
5	Labour costs too high	15	Input quality was poor
6	Rain related yield loss	16	Other company was giving gifts, incentives for contracting
7	Improper Payment by Firm	17	No advance given by the firm
8	Low price for output	18	Personal reasons, death in the family, etc.
9	High cost of cultivation relative to other crops		
10	Pest danger or infestation		

➔If NO,

2) What are the reasons you did not contract with SAMPLE FIRM?

1	The firm does not contract in this village	8	Low price for output
2	The firm did not approach me	9	Don't Know
3	I was not interested	10	Did not fulfil their eligibility criteria
4	They choose their own people	11	Other company was giving gifts, incentives for contracting
5	Did not have faith in the company	12	No advance given by the firm
6	People I know do not contract with SAMPLE FIRM	13	Personal reasons, death in the family, etc.
7	Improper Payment by SAMPLE FIRM		

20. How risky do you think contracting with THE SAMPLE FIRM is? [Rank on a scale of 0 to 10; 0=No risk at all, 10=Extremely Risky]

_____

C. ELICITING EXPECTATIONS FROM THE CONTRACT FARMER

21. We would like to learn about your expectations regarding earnings and yield of gherkins. If you were to follow the same set of procedures, with the same firm and field officer, under the same contractual terms and assuming the general conditions in your family, village and weather are unchanged, out of 20 seasons growing the contract crop in a plot of your choice, which has the same qualities, what is the number of occasions you would attain the minimum/ the most likely / the maximum price/yield/net income per acre of the commodity?

Variable	Unit Please note unit e.g. Rs/cent or Rs./acre	What is the **minimum** value you expect?	What is the most likely value?	What is the **maximum** value you expect?	If I give you these 20 tokens and ask you to give the most tokens to the number you have said is most likely, the next most tokens you think is the next most likely and the least tokens to the least likely.		
					Number against **Minimum** Value?	Number against the **most likely** value?	Number against **maximum** value
Price (unit value) [Since gherkins has many grade, the focus here is on eliciting an average unit value as "price."]	Rs./kg.						
Yield							
■ **Net Income**							

[Investigator: Write number of tokens in the blank. To check for their understanding, (1) they should at least assign a token to each of the three outcomes they earlier proposed and (2) the most likely outcome should have the most tokens]

22. What, in your opinion, are the most important risks/ benefits associated with contracting? [*Investigator*: Please pay careful attention to this set of questions. This pertains only to the **gherkins.** To start with **do not prompt**. Let the farmer mention the risks/benefits first.Once the box has been filled out, then read out the options the farmer has not mentioned to verify that they are not considered risks by the farmer. If the farmer is reluctant to answer these set of questions, then try prompting with examples of attributes.]

Type of Risk/Benefit [investigator: The term used differs across regions, make sure you find out what term to use]	Is this risk/benefit present? [*Investigator: Let the farmer list the risks. If the farmer mentions a risk, write 1 against it, if not mark 0. Then move to the next column]*	How important do you think each of these risks/beenfits is to your well-being? *[Rank on a scale of 0-10 with 0 means not important to you at all, 10 means it is extremely important to you.]*	What is the probability of the following event happening in contracting with THE "FIRM" *[If you contract 10 times how many times do you feel this event will occur.]*
Yield risk			
Price risk			
Risk of firm not coming back to pick up the produce at harvest time.			
Risk of delay in payment			
Risk of non-availability of credit			
Risk of non-availability of inputs			
Risk of poor quality inputs			

Risk of wrong technical advice			
Risk of rejection/downgrading of produce by the firm, quality			
Risk of the firm not coming to contract in the future			
Risk of losing land			
Others 1 (specify) _____			
Others 2 (specify) _____			
BENEFITS			
Inputs provided by the firm on credit			
Advance provided by firm			
Credit available against contract			
Technical advice available			
Lumpsum payment			
Timely payment			
Price fixed, certainty			
Reduced transaction time			
Assured buyer			
Positive yield risk			
Farm-gate collection			
Others 1 (specify) _____			

23. If you were not contracting for GHERKINS with the FIRM this season, what would be your next best option? [Investigator: Read the option aloud and get the next best alternative – the name of the company and/or crop.]

    1) Gherkins contract for another company (specify the name of company/agent)_____

        (a) If this is not an option, what would you grow instead? _____

    2) Another crop instead of gherkins [Inv: Please note which crop the farmer would have cultivated] _____

[Investigator:The next set of questions focuses on the crop mentioned in 1(a) or 2]

D. RISK PERCEPTIONS OF ALTERNATIVES

24. Had you chosen this alternative option for the current season, if you were to follow the same set of procedures, assuming the general conditions in your family, village and weather are unchanged, out of 20 seasons growing the contract crop in a plot of your choice, which has the same qualities, what is the number of occasions you would attain the minimum/ the most likely / the maximum price/yield/net income per acre of the commodity? [Investigator: For the next few questions the alternative the farmer has mentioned above as the non-contract option]

Variable	Unit Please note unit Rs/kg, quintal./acre for yield, etc.	What is the **minimum** value you expect?	What is the most likely value?	What is the **maximum** value you expect?	If I give you these 20 tokens and ask you to give the most tokens to the number you have said is most likely, the next most tokens you think is the next most likely and the least tokens to the least likely.		
					Number against Minimum Value?	Number against the most likely value?	Number against **maximum** value
Price							

Yield							
■ **Net Income**							

25. What other risks /benefits do you associate **with the alternate crop?** [Follow the same procedure as for the previous RISK/BENEFIT TABLE]

Type of Risk/Benefit [investigator: The term used differs across regions, make sure you find out what term to use] (A)	Is this risk/benefit present? [Investigator: Write 1 if YES, 0 if NO] (B)	How important do you think each of these risks/benefits is to your well-being? *[Rank on a scale of 0-10 with 0 means not important to you at all, 10 means it is extremely important to you] (C)*	How frequently do you face this situation? *[In 10 seasons, how many times do you feel this event will occur? Note for those who are contracting for the first time, this is difficult.]*
(1)Risk of non-availability of credit			
(2) Risk of non-availability of technical advice			
(3) Risk of poor quality inputs			
(4) Risk of non-availability of inputs			
(5) Non availability of hired labour			
(6) Not finding a buyer			
(7) Delay in payment			
(6) Rejection of produce			
(7) Weather risk/ yield			
(8) Price risk, price drop			
(9) Others _____			
BENEFITS			
Positive Price Risk, price rise			
Can sell anytime, flexibility			
Quality is not critical			
Known trader in the market			
Positive yield risk			
Others 1 (specify) _____			

E. COST AND RETURNS FROM CONTRACT CULTIVATION & TRANSACTIONS COST [For this section, data should pertain to the previous contracting season. If the farmer is contracting for the first time and the harvest is not yet over, then fill in expected rates where actuals are not available, for e.g., for labour costs for harvesting. Denote with "E" alongside entry if the values are expected, not actual.]

26. Could you give some details of your costs and returns for the **last completed season**?

Operations	Labour Cost						Machine (hr)	Input/output		
	Male(days)		Female(days)		Labour cost for hired			Quantity	Unit price	Source (1=Purchased; 2=Owned: 3=Company Provided
	Hired	Family	labour Hired	Family	Male	Female				
Variable cost										
1. Land preparation										
2. Seed bed preparation										
3. FYM/Compost										
4. Planting/sowing										
5. Seeds										
6. Seed treatment										
7. Fertilizer application										
8. Micro nutrient application										
9. Interculture operation										
10. Weeding/weedicide application										
11. Plant protection chemicals										
12. Irrigation										
13. Harvesting										
14. Equipment repair and maintenance										
TRANSACTIONS COST										
15. Post harvest operations										
16. Packing and Sorting										
17. Transport to the Market/Collection Center										
18. Commission on transaction										
19. Interest on working capital @7%										
Fixed cost										
1. Land rent										
2. Depreciation on farm assets										
3. Interest on fixed capital 12%										
Total cost										
Main product yield										
By product yield										
Gross return										
Net return										

27. What is the volume of product rejected as not meeting quality standards? _____ kgs

28. What is the volume of product that was lost due to spoilage /wastage? _____ kgs

29. How many days did it take for you to receive full payment after completion of the transaction? _____days

G. ENFORCEMENT

30. In the last season, have you used the inputs for the contract crop for your other *non-contract* crops? Yes / No

➔If YES,

a. What is the proportion of inputs that you were given did you use for other *non-contract* crops _____ %

31. In the last season, have you sought or used the firm or agent's advice for your other crops? Yes / No

➔If YES,

a. Please explain _____

32. In the last season, has any other company approached you or have you sold the **contract crop** to any other buyer (local market or another company) Yes / No

➔If YES,

a. What proportion of the contract crop did you sell? (in %) _____%

b. What are the reasons you sold elsewhere? _____

33. According to you, what proportion of the contract farmers in your village or outside sell their contract crop to other buyers? _____%

34. How often do you think other contract farmers in your village sell the contracted crop to other buyers?

(1) Regularly (2) Frequently (3) Not so frequently (4) Rarely (5) Never

---

35. The last time you contracted or delivered the contracted commodity to the FIRM, was the price offered by other companies, on an average, higher or lower than the contract price? [Inv: Circle the relevant option and note down the two prices].

1) Contract price was lower
2) About the same
3) Contract price was higher

Contract Price (in Rs/kg.) Grade 1_____Grade 2_____Grade 3_____ Grade 4_____ Grade 5_____
Price of Competing Firm (in Rs./kg) .) Grade 1_____Grade 2_____Grade 3_____ Grade 4_____ Grade 5_____

36. Would you accept a this FIRM's contract if it offered you a lower price than other FIRMS operating in this region? Yes / No / Unsure

➔If YES, how much lower can it be before you reject the contract? **(Inv.Get the amount for the smallest gherkin – that is the highest value that you noted above)**

Contract price can be Rs._____/kg lower / Unsure

➔If NO, how much higher would the contract price have to be above the competitor price for you to accept the contract? **(Inv.Get the amount for the smallest gherkin – that is the highest value that you noted above)**

Contract price should be at least Rs. _____/kg higher / Unsure

---

37. Since you started contracting, have you ever faced a situation where you have been <u>unable</u> to deliver the contracted produce at the required time and place? Yes / No

a. Please describe.

1) Weather related yield loss/ Natural causes/Water shortage
2) When I feel my profits might be harmed, or the firm does not give a good price for the output
3) Would never happen
4) When I am constrained for cash
5) Company delayed in coming /delays in payments
6) Could not meet quality standards

38. In general, how important do you think it is for you to honour the contract?

1) Extremely important
2) Quite important
3) Important
4) Not so important
5) Not at all important

39. If you were to violate the contract, what do you feel would be the consequences? [Investigator: Allow the farmer to articulate his/her thoughts, and if appropriate ask the questions below to get specific answers as a follow-up]

1	Nothing	7	Warn us
2	They will not pay our dues/ demand that we return the money	8	Take some appropriate action
3	Will go to court	9	Fight with us
4	Will approach the police	10	Complain to the village leader
5	Will tell on us to other companies	11	They will lose faith in us
6	Stop contracting with us		

40. In your experience with this company has there been an occasion when you felt they did not keep up with the terms of the contract?
Yes / No

a. If YES, please describe what happened and when

_____

41. In general, If the firm does not honour the contract, what would you do? [Circle one, the first response]
1) Nothing, what can I do? Powerless
2) Depending on the problem, we will decide
3) Go to court
4) Approach the police
5) Complain to the local authorities /police
6) Stop Contracting with this firm, contract with other firms
7) Will make a representation to them
8) Protest won't harvest the crop
9) Give up the contract crop
10) Will not let the firm come into our village
11) Demand Compensation, Lose faith
12) Other (please Specify) _____

H. RELATIONSHIP

42. In general, how much power to voice your opinions do you feel in this relationship with the company? [Investigator: Read out all the options. Circle only one. If the farmer elaborates, note his/her response below]
a) Very powerful
b) Somewhat powerful
c) Neither powerful nor powerless
d) Somewhat powerless/vulnerable
e) Completely powerless/vulnerable

43. How many times in the last **two weeks** did the agent visit your farm? _____

44. Today, how risky do you think contracting with is?
[Investigator: Rank on a scale of 0 to 10; 0 means no risk at all, 10 means extremely risky] _____

45. What, according to you, are the chances that the ***company stops contracting with you*** within the next three years?
(1) Almost certainly (2) Very likely (3) Somewhat likely (4) Unlikely (5) Not at all likely

46. Would you continue to grow the contract crop if you stopped contracting with this company? Yes / No

47. What, according to you, are the chances that ***you will want to stop contracting*** with this firm within the next three years?
(1) Almost certainly (2) Very likely (3) Somewhat likely (4) Unlikely (5) Not at all likely

48. For the next season, do you plan to bring more area under gherkins or less?
(1) Will increase area (2) Will maintain the same area (3) Will decrease the area (4) Have not decided yet

49. To what extent has participating in contract farming enhanced the economic well-being of your family?
(1) To a great extent
(2) To some extent
(3) Neither enhanced nor diminished
(4) Has diminished
(5) Has diminished a great deal

[Investigator: Request the farmer to elaborate and offer examples for the above,e.g. start a non-farm business, or buy land, build a house, etc. and record them under Investigator Observations at the end of the Questionnaire]

50. Taken all together, how would you say things are for you these days: would you say you are: _____
[Inv: 1=Very Happy, 2=Pretty happy, 3=Not too happy]

I. SOCIO-ECONOMIC STATUS OF THE HOUSEHOLD

51. What is the age of the head of the household? _____years

52. How many members are there in your nuclear family? _____

    1) Of these, the number of members in the age group 0-15 years of age? _____

53. What is your social group?
    1) SC/St
    2) MBC
    3) OBC
    4) Others (specify) _____

54. What is the education level you have attained?
    1) Illiterate
    2) Literate (below primary)
    3) Primary (Class V complete)
    4) Upper Primary Class (Class VIII complete)
    5) Secondary (Class X complete)
    6) High School (Class XII complete)
    7) Others (specify) _____

55. What is the education level of the most educated member of the household?
    1) Illiterate
    2) Literate (below primary)
    3) Primary (Class V complete)
    4) Upper Primary Class (Class VIII complete)
    5) Secondary (Class X complete)
    6) High School (Class XII complete)
    7) Others (specify) _____

56. We would like to know your asset position. Does the household own any of the following items? [Investigator: Write the number of pieces of the object if applicable and 0 if not applicable]

	ASSET TYPE	**Currently possesses (write Qty and units)**
a.	Radio	
b.	Telephone Landline	
c.	Mobile	
d.	TV	
e.	Watch	
f.	Pressure cooker	
g.	Bicycle	
h.	Scooter/ Motorcycle	
i.	Livestock	
j.	Poultry	
k.	Tractor	

57. What is your main source of light now? ___ _____
[Inv.:1=Kerosene; 2=Candle; 3=Electricity; 4=Electricity with inverter; 5=Solar energy; 6=LPG/biogas; 7=Battery (torch); 8=Diesel generator; 9=Other, specify_____]

58. What is your main source of heat for cooking now? _____
[Inv.1=Wood/charcoal; 2=Kerosene; 3=Electricity; 4= LPG/biogas; 5=Crop residues; 6=Other, specify_____]

59. What is your main source of drinking water? _____
[Inv: 1=River/canal; 2=Public well; 3=Public handpump; 4=Own handpump; 5=Own motorpump or other waterlifting devices; 6=Piped water; 7=Rainwater; 8=Water filling station; 9=Other, specify:_____]

60. What were your main sources of income in the **past one year** ? *[Attempt to get the value in Rs. If this is difficult or the farmer is vague about it, try to record the percentage of annual income from each source.]*

1) Cultivation _____
2) Wage labour in Agriculture _____
3) Wage labour off farm _____
4) Self Employment _____
5) Transfers and Remittances _____

61. What proportion of household foodgrain consumption do you buy from outside (e.g. ration shop)? _____%

62. How much of outstanding debt do you have at the moment? Rs. _____

J. MEASURING RISK AVERSION AND AMBIGUITY AVERSION

Risk Aversion

63. You have the choice of (1) accepting Rs. 150 from us right now for sure. (2) Or alternatively, instead of the Rs. 150, we will toss a coin, if it is heads you get Rs.210 and if it is tails, you get Rs.90.

What would you rather choose to do? (write 1 or 2)	
Write amount _____	

Ambiguity Aversion

64. Now, we would like to offer you another chance to win. We would like to offer you Rs.150 through another game
Bag 1 contains 4 white balls and 6 black balls. You pick a ball. You will win Rs.150 if the ball you pick is white.
Bag 2 contains 10 balls. Some are white and some are black. I don't know for sure how many of each there are. You need to name one color. And you will win Rs.150 if you pick the ball of the color you name.

Which bag will you choose? (write 1 or 2)	
Enumerator: Please allow the respondent to pick a ball from his chosen bag	
The reward from this game is	

Lottery Price

65. Supposing you were offered a lottery ticket, where the prize is decided by a coin flip. You win Rs.300 if Heads and 150 if Tails. What is the maximum you would be willing to pay for the lottery ticket?

Rs. _____

K. INVESTIGATOR OBSERVATIONS

66. LOCATIONAL ATTRIBUTES

a. Distance of the farmer's field from the collection point _____ metres

b. Distance of the farmer's field from the nearest metalled roadhead _____ metres

c. Distance of the farmer's field from the nearest market for contract crop _____ metres

d. Distance of the farmer's field from the nearest market for the **alternate** crop _____ metres

e. Distance of the farmer's house from the panchayat president's house _____ metres

f. Distance of the farmer's house from the main village cluster/centre of village _____ metres

67. House Type
1) Kaccha (Odu, mud)
2) Pacca (Cement brick)

68. How would you rate the economic condition of this household compared to other households in the village?
1) Among the poorest 20%
2) Poorer than average but not among the poorest 20%
3) About Average
4) Better than average but not among the richest 20%
5) Among the richest 20%
6) Unable to observe

MAKE NOTE OF ANY QUOTES, COMMENTS, OR INCIDENTS THAT YOU THINK ARE RELEVANT AND INTERESTING. PLEASE MAKE NOTE OF IT IN SOME DETAIL.

Schedule 1(C): ATTRITION-GHERKINS FARMER QUESTIONNAIRE

[Investigator: Interview the head of the farm household in the list of selected farmers. If the farmer is unavailable, do not interview anyone else in the household. Introduce yourself and explain the purpose of the survey. Make sure you convey all the points mentioned in the Oral Consent Transcript in the same words. Indicate the approximate time the interview will take. If the farmer has written records encourage him/her to refer to these, especially if the contract farmer has passbooks. Make sure the farmer has a chance to clarify his/her doubts and give consent before you start the interview.]

Name of the Investigator	Date of Interview	
FARMER ID: (Copy from the Sampling Sheet after verifying identity of the farmer)		
Hamlet	Panchayat	Revenue Village
Block	Taluk	District

A. LANDHOLDING, CROPPING PATTERN

1. *[Investigator: This is a confirmatory question*] What is the main occupation of your household in the last 1 year or 365 days?
    1) Casual Agricultural Labour
    2) Casual Non-Agricultural Labour
    3) Cultivation
    4) Other Self-employed
    5) Salaried employment
    6) Other (specify) _____

2. How much land does your household currently **operate?** (a)Owned _____ cents / acres / kuzhi
    (b) Leased _____ cents /acres /kuzhi

    1. What proportion of your land is irrigated? _____ %
    2. What is the **main** source of irrigation?
        1) Well
        2) Tubewell
        3) River
        4) Canal
        5) Rainfed
        6) Other (specify) _____

3. Compared to other farmers' lands in your village, would you say that the agricultural land you own is
    1) More fertile
    2) Equally (or just as) fertile
    3) Less fertile

4. What has been the cropping pattern ***this past year***? [*Investigator: Include land left fallow*]

	(A) Crop [Investigator: Include tree crops as well e.g., coconut, banana]	(B) Month of Sowing (for crops other than trees).	(C) Month of Harvest (for crops other than trees	(D) Area (in acres/centskuzhi) Note units	Quantity Produced (E) (Please note units)	Quantity Sold (F) (Please note units)	(G) Marketing Channel
1							
2							
3							
4							
5							
6							

1=Trader, 2=Pre-harvest Contractor, 3= Direct to consumer, 4= Contract (Intermediary), 5=Contract (Firm), 6=Self Consumption

B. PAST EXPERIENCE You mentioned that you contracted for Gherkins with THE "FIRM" earlier,

5. When you began contracting, what are the reasons you decided to contract with THE "FIRM"?

6. Since you first began contracting with THE "FIRM", please give some details about your contracting history.

Season and Year (A) [Investigator: Write Year within brackets]		Seeds Provided (in kgs) (B)	Acreage sown (in acres) (C)	Actual Production (in kgs.) (D)	Sold to the Company (in kgs.) (E)
1	First Year with THE "FIRM" (_____)				
2	Current Season (_____)				
3	The Last Season (_____)				

7. ★ Why did you eventually give up? Please elaborate. [Investigator: Allow the farmer to respond circle the appropriate choices.]

1	The firm stopped contracting in the village	11	Health Issues on account of contract crop
2	The firm refused to give contract to me, though they were contracting in the village	12	Soil Quality deteriorated
3	Too much labour required	13	I was unable to deliver as per contract
4	Losses / Not much profits	14	Inadequate /Improper advice by company
5	Labour costs too high	15	Input quality was poor
6	Rain related yield loss	16	Other company was giving gifts, incentives for contracting
7	Improper Payment by Firm	17	No advance given by the firm
8	Low price for output	18	Personal reasons, death in the family, etc.
9	High cost of cultivation relative to other crops		
10	Pest danger or infestation		

8. Do you have contact with other farmers who pursue contract farming, in this crop or in other crops? Yes / No

➔**If YES,**

i. **Which crops?**

(1) Papaya (2) Gherkins (3) Marigold (4) Poultry (5) Other (specify)_____

ii. **Are these**

1. Relatives /family in your village
2. Relatives/family in another village
3. Friends in this village
4. Friends elsewhere
5. Acquaintances in this village
6. Other (Specify)_____

9. Today, how risky do you think contracting with THE FIRM is?
[Investigator: Rank on a scale of 0 to 10; 0 means no risk at all, 10 means extremely risky] _____

10. When you gave up contracting for gherkins what crop did you grow instead? [Investigator: Read the option aloud and get the next best alternative – the name of the company and/or crop.]

i. Another crop instead of gherkins _____

ii. Gherkins for another company _____

C. ELICITING EXPECTATIONS FROM THE FARMER

11. What are your expectations for the **alternate crop** you have mentioned? If you were to follow the same set of procedures, and assuming the general conditions in your family, village and weather are unchanged, out of 20 seasons growing the contract crop in a plot of your choice, which has the same qualities, what is the number of occasions you would attain the minimum/ the most likely / the maximum price/yield/net income per acre of the commodity?

Variable	Unit Please note unit Rs/kg, quintal./acre for yield, etc.	What is the **minimum** value you expect?	What is the most likely value?	What is the **maximum** value you expect?	If I give you these 20 tokens and ask you to give the most tokens to the number you have said is most likely, the next most tokens you think is the next most likely and the least tokens to the least likely.		
					Number against **Minimum** Value?	Number against the **most likely** value?	Number against **maximum** value
Price							
Yield							
■ **Net income**							

[Investigator: Write number of tokens in the blank. To check for their understanding, (1) they should at least assign a token to each of the three outcomes they earlier proposed and (2) the most likely outcome should have the most tokens]

12. What are the kinds of risk/benefits you associate **with the alternate crop?** [*Investigator*: Please pay careful attention to this set of questions. This pertains only to the **alternate crop.** To start with **do not prompt**. Let the farmer mention the risks/benefits first. Once the box has been filled out, then read out the options the farmer has not mentioned to verify that they are not considered risks by the farmer. If the farmer is reluctant to answer these set of questions, then try prompting with examples of attributes.]

Type of Risk/Benefit [investigator: The term used differs across regions, make sure you find out what term to use] (A)	Is this risk/benefit present? [Investigator: Write 1 if YES, 0 if NO] (B)	How important do you think each of these risks/benefits is to your well-being? *[Rank on a scale of 0-10 with 0 means not important to you at all, 10 means it is extremely important to you] (C)*	How frequently do you face this situation? *[In 10 seasons, how many times do you feel this event will occur? Note for those who are contracting for the first time, this is difficult.]*
(1)Risk of non-availability of credit			
(2) Risk of non-availability of technical advice			
(3) Risk of poor quality inputs			
(4) Risk of non-availability of inputs			
(5) Non availability of hired labour			
(6) Not finding a buyer			
(7) Delay in payment			
(6) Rejection of produce			
(7) Weather risk/ yield			
(8) Price risk, price drop			
(9) Others _____			

Type of Risk/Benefit [investigator: The term used differs across regions, make sure you find out what term to use] (A)	Is this risk/benefit present? [Investigator: Write 1 if YES, 0 if NO] (B)	How important do you think each of these risks/benefits is to your well-being? *[Rank on a scale of 0-10 with 0 means not important to you at all, 10 means it is extremely important to you] (C)*	How frequently do you face this situation? *[In 10 seasons, how many times do you feel this event will occur? Note for those who are contracting for the first time, this is difficult.]*
BENEFITS			
Positive Price Risk, price rise			
Can sell anytime, flexibility			
Quality is not critical			
Known trader in the market			
Positive yield risk			
Others 1 (specify) _____			

13. Had you been contracting for **gherkins instead of this alternative** what would your expectations of net earnings be? We would like to learn about your expectations regarding earnings and yield of gherkins. If you were to follow the same set of procedures, with the same firm and field officer, under the same contractual terms and assuming the general conditions in your family, village and weather are unchanged, out of 20 seasons growing the contract crop in a plot of your choice, which has the same qualities, what is the number of occasions you would attain the minimum/ the most likely / the maximum price/yield/net income per acre of the commodity?

Variable	Unit Please note unit Rs/kg, quintal./acre for yield, etc.	What is the **minimum** value you expect?	What is the most likely value?	What is the **maximum** value you expect?	If I give you these 20 tokens and ask you to give the most tokens to the number you have said is most likely, the next most tokens you think is the next most likely and the least tokens to the least likely.		
					Number against **Minimum** Value?	Number against the **most likely** value?	Number against **maximum** value
Price (unit value) [Since gherkins has many grade, the focus here is on eliciting an average unit value as "price."]	Rs./kg.						
Yield	Quintals/acre						
■ **Net income**	Rs./season						

[Investigator: Write number of tokens in the blank. To check for their understanding, (1) they should at least assign a token to each of the three outcomes they earlier proposed and (2) the most likely outcome should have the most tokens]

14. You have talked about why you discontinued gherkins. What, in your opinion, are the most important risks/benefits associated with contracting? [*Investigator*: Please pay careful attention to this set of questions. This pertains only to **gherkins.** To start with **do not prompt**. Let the farmer mention the risks/benefits first.Once the box has been filled out, then read out the options the farmer has not mentioned to verify that they are not considered risks/benefits by the farmer. If the farmer is reluctant to answer these set of questions, then try prompting with examples of attributes.]

Type of Risk/Benefits [investigator: The term used differs across regions, make sure you find out what term to use]	Is this risk/benefit present? [*Investigator: Let the farmer list the risks. If the farmer mentions a risk, write 1 against it, if not mark 0. Then move to the next column]*	How important do you think each of these risks is to your well-being? *[Rank on a scale of 0-10 with 0 means not important to you at all, 10 means it is extremely important to you.]*	What is the probability of the following event happening in contracting with THE "FIRM" *[If you contract 10 times how many times do you feel this event will occur.]*
Yield risk			
Price risk			
Risk of firm not coming back to pick up the produce at harvest time.			
Risk of delay in payment			
Risk of non-availability of credit			
Risk of non-availability of inputs			
Risk of poor quality inputs			
Risk of wrong technical advice			
Risk of rejection/downgrading of produce by the firm, quality			
Risk of the firm not coming to contract in the future			
Risk of losing land			
Others 1 (specify) _____			
Others 2 (specify) _____			
BENEFITS			
Inputs provided by the firm on credit			
Advance provided by firm			
Credit available against contract			
Technical advice available			
Lumpsum payment			
Timely payment			
Price fixed, certainty			
Reduced transaction time			
Assured buyer			
Positive yield risk			
Farm-gate collection			
Others 1 (specify) _____			

E. COST AND RETURNS FROM ALTERNATE CROP CULTIVATION & TRANSACTIONS COST [For this section, data should pertain to the previous COMPLETED SEASON..]

15. Could you give some details of your costs and returns for the **last completed season**?

Operations	Labour Cost							Input/output		
	Male(days)		Female(days)		Labour cost for hired		Machine (hr)	Quantity	Unit price	Source (1=Purchased; 2=Owned: 3=Company Provided
	Hired	Family	labour Hired	Family	Male	Female				
Variable cost										
1. Land preparation										
2. Seed bed preparation										
3. FYM/Compost										
4. Planting/sowing										
5. Seeds										
6. Seed treatment										
7. Fertilizer application										
8. Micro nutrient application										
9. Interculture operation										
10. Weeding/weedicide application										
11. Plant protection chemicals										
12. Irrigation										
13. Harvesting										
14. Equipment repair and maintenance										
TRANSACTIONS COST										
15. Post harvest operations										
16. Packing and Sorting										
17. Transport to the Market/Collection Center										
18. Commission on transaction										
19. Interest on working capital @7%										
Fixed cost										
1. Land rent										
2. Depreciation on farm assets										
3. Interest on fixed capital 12%										
Total cost										
Main product yield										
By product yield										
Gross return										
Net return										

16. What is the volume of product rejected as not meeting quality standards? _____ kgs

17. What is the volume of product that was lost due to spoilage /wastage? _____ kgs

18. How many days did it take for you to receive full payment after completion of the transaction? _____days

ENFORCEMENT

19. In the last season you contracted, did you use the inputs for the contract crop for your other *non-contract* crops? Yes / No

➔If YES,

a. What is the proportion of inputs that you were given did you use for other *non-contract* crops _____ %

20. In the last season you contracted, did you seek or use the firm or agent's advice for your other crops? Yes / No

➔If YES,

a. Please explain _____

21. In the last season you contracted, did any other company approached you or have you sold the **contract crop** to any other buyer (local market or another company) Yes / No

➔If YES,

a. What proportion of the contract crop did you sell? (in %) _____%

b. What are the reasons you sold elsewhere? _____

22. According to you, what proportion of the contract farmers in your village or outside sell their contract crop to other buyers? _____%

23. How often do you think other contract farmers in your village sell the contracted crop to other buyers?

(1) Regularly (2) Frequently (3) Not so frequently (4) Rarely (5) Never

---

24. The last time you contracted or delivered the contracted commodity to the FIRM, was the price offered by other companies, on an average, higher or lower than the contract price? [Inv: Circle the relevant option and note down the two prices].

1. Contract price was lower
2. About the same
3. Contract price was higher

Contract Price (in Rs/kg.) Grade 1_____Grade 2_____Grade 3_____ Grade 4_____ Grade 5_____

Price of Competing Firm (in Rs./kg) .) Grade 1_____Grade 2_____Grade 3_____ Grade 4_____ Grade 5_____

25. Would you accept this FIRM's contract if it offered you a lower price than other FIRMS operating in this region? Yes / No / Unsure

➔If YES, how much lower can it be before you reject the contract? **(Inv.Get the amount for the smallest gherkin – that is the highest value that you noted above)**

Contract price can be Rs._____/kg lower / Unsure

➔If NO, how much higher would the contract price have to be above the competitor price for you to accept the contract? **(Inv.Get the amount for the smallest gherkin – that is the highest value that you noted above)**

Contract price should be at least Rs. _____/kg higher / Unsure

---

26. When you contracted, did you ever face a situation where you have been <u>unable</u> to deliver the contracted produce at the required time and place? Yes / No

a. Please describe.

1. Weather related yield loss/ Natural causes/Water shortage
2. When I feel my profits might be harmed, or the firm does not give a good price for the output
3. Would never happen
4. When I am constrained for cash
5. Company delayed in coming /delays in payments
6. Could not meet quality standards

27. In general, how important did you think it is for you to honour the contract?

1. Extremely important
2. Quite important
3. Important
4. Not so important
5. Not at all important

28. What do you feel the company does when as contract farmer you do not keep up the terms of contract? [Investigator: Allow the farmer to articulate his/her thoughts, and if appropriate ask the questions below to get specific answers as a follow-up]

1	Nothing	7	Warn us
2	They will not pay our dues/ demand that we return the money	8	Take some appropriate action
3	Will go to court	9	Fight with us
4	Will approach the police	10	Complain to the village leader
5	Will tell on us to other companies	11	They will lose faith in us
6	Stop contracting with us		

29. In general, If the firm does not honour the contract, what would you do? [Circle one, the first response]
    1. Nothing, what can I do? Powerless
    2. Depending on the problem, we will decide
    3. Go to court
    4. Approach the police
    5. Complain to the local authorities /police
    6. Stop Contracting with this firm, contract with other firms
    7. Will make a representation to them
    8. Protest won't harvest the crop
    9. Give up the contract crop
    10. Will not let the firm come into our village
    11. Demand Compensation, Lose faith
    12. Other (please Specify) _____

30. In general, how much power to voice your opinions do you feel in this relationship with the company? [Investigator: Read out all the options. Circle only one. If the farmer elaborates, note his/her response below]
    1. Very powerful
    2. Somewhat powerful
    3. Neither powerful nor powerless
    4. Somewhat powerless/vulnerable
    5. Completely powerless/vulnerable

31. Today, how risky do you think contracting with FIRM is?
    [Investigator: Rank on a scale of 0 to 10; 0 means no risk at all, 10 means extremely risky] _____

32. What, according to you, are the chances that the ***company resumes contracting with you*** within the next three years?
    (1) Almost certainly (2) Very likely (3) Somewhat likely (4) Unlikely (5) Not at all likely

33. What, according to you, are the chances that ***you will want to resume contracting*** with this firm within the next three years?
    (1) Almost certainly (2) Very likely (3) Somewhat likely (4) Unlikely (5) Not at all likely

34. For the next season, do you plan to bring more area under gherkins or less?
    (1) Will increase area (2) Will maintain the same area (3) Will decrease the area (4) Have not decided yet

35. To what extent did participating in contract farming enhanced the economic well-being of your family?
    (1) To a great extent
    (2) To some extent
    (3) Neither enhanced nor diminished
    (4) Has diminished
    (5) Has diminished a great deal

[Investigator: Request the farmer to elaborate and perhaps offer examples for the above and record them under Investigator Observations at the end of the Questionnaire]

36. Taken all together, how would you say things are for you these days: would you say you are: _____
[Inv: 1=Very Happy, 2=Pretty happy, 3=Not too happy]

I. SOCIO-ECONOMIC STATUS OF THE HOUSEHOLD

37. What is the age of the head of the household? _____years

38. How many members are there in your nuclear family? _____

    1. Of these, the number of members in the age group 0-15 years of age? _____

39. What is your social group?
    1. SC/ST
    2. MBC
    3. OBC
    4. Others (specify) _____

40. What is the education level you have attained?
    1) Illiterate
    2) Literate (below primary)
    3) Primary (Class V complete)
    4) Upper Primary Class (Class VIII complete)
    5) Secondary (Class X complete)
    6) High School (Class XII complete)
    7) Others (specify) _____

41. What is the education level of the most educated member of the household?
    1) Illiterate
    2) Literate (below primary)
    3) Primary (Class V complete)
    4) Upper Primary Class (Class VIII complete)
    5) Secondary (Class X complete)
    6) High School (Class XII complete)
    7) Others (specify) _____

42. We would like to know your asset position. Does the household own any of the following items? [Investigator: Write the number of pieces of the object if applicable and 0 if not applicable]

	ASSET TYPE	**Currently possesses (write Qty and units)**
a.	Radio	
b.	Telephone Landline	
c.	Mobile	
d.	TV	
e.	Watch	
f.	Pressure cooker	
g.	Bicycle	
h.	Scooter/ Motorcycle	
i.	Livestock	
j.	Poultry	
k.	Tractor	

43. What is your main source of light now? ___ _____
[Inv.:1=Kerosene; 2=Candle; 3=Electricity; 4=Electricity with inverter; 5=Solar energy; 6=LPG/biogas; 7=Battery (torch); 8=Diesel generator; 9=Other, specify_____]

44. What is your main source of heat for cooking now? _____
[Inv.1=Wood/charcoal; 2=Kerosene; 3=Electricity; 4= LPG/biogas; 5=Crop residues; 6=Other, specify_____]

45. What is your main source of drinking water? _____
[Inv: 1=River/canal; 2=Public well; 3=Public handpump; 4=Own handpump; 5=Own motorpump or other waterlifting devices; 6=Piped water; 7=Rainwater; 8=Water filling station; 9=Other, specify:_____]

46. What were your main sources of income in the **past one year** ? *[Attempt to get the value in Rs. If this is difficult or the farmer is vague about it, try to record the percentage of annual income from each source.]*

    1. Cultivation _____
    2. Wage labour in Agriculture _____
    3. Wage labour off farm _____
    4. Self Employment _____
    5. Transfers and Remittances _____

47. What proportion of household foodgrain consumption do you buy from outside (e.g. ration shop)? _____%

48. How much of outstanding debt do you have at the moment? Rs. _____

J. MEASURING RISK AVERSION AND AMBIGUITY AVERSION

Risk Aversion

49. You have the choice of (1) accepting Rs. 150 from us right now for sure. (2) Or alternatively, instead of the Rs. 150, we will toss a coin, if it is heads you get Rs.210 and if it is tails, you get Rs.90.

What would you rather choose to do? (write 1 or 2)	
Write amount _____	

Ambiguity Aversion

50. Now, we would like to offer you another chance to win. We would like to offer you Rs.150 through another game
Bag 1 contains 4 white balls and 6 black balls. You pick a ball. You will win Rs.150 if the ball you pick is white.
Bag 2 contains 10 balls. Some are white and some are black. I don't know for sure how many of each there are. You need to name one color. And you will win Rs.150 if you pick the ball of the color you name.

Which bag will you choose? (write 1 or 2)	

Enumerator: Please allow the respondent to pick a ball from his chosen bag

The reward from this game is	

Lottery Price

51. Supposing you were offered a lottery ticket, where the prize is decided by a coin flip. You win Rs300 if Heads and 150 if Tails. What is the maximum you would be willing to pay for the lottery ticket?

Rs. _____

K. INVESTIGATOR OBSERVATIONS

52. LOCATIONAL ATTRIBUTES

a. Distance of the farmer's field from the collection point _____ metres

b. Distance of the farmer's field from the nearest metalled roadhead _____ metres

c. Distance of the farmer's field from the nearest market for contract crop _____ metres

d. Distance of the farmer's field from the nearest market for the **alternate** crop _____ metres

e. Distance of the farmer's house from the panchayat president's house _____ metres

f. Distance of the farmer's house from the main village cluster/centre of village _____ metres

53. House Type
   1) Kaccha (Odu, mud)
   2) Pacca (Cement brick)

54. How would you rate the economic condition of this household compared to other households in the village?
   1) Among the poorest 20%
   2) Poorer than average but not among the poorest 20%
   3) About Average
   4) Better than average but not among the richest 20%
   5) Among the richest 20%
   6) Unable to observe

MAKE NOTE OF ANY QUOTES, COMMENTS, OR INCIDENTS THAT YOU THINK ARE RELEVANT AND INTERESTING. PLEASE MAKE NOTE OF IT IN SOME DETAIL.

Schedule 1(D): NEVER-GHERKINS FARMER QUESTIONNAIRE

[Investigator: Interview the head of the farm household in the list of selected farmers. If the farmer is unavailable, do not interview anyone else in the household. Introduce yourself and explain the purpose of the survey. Make sure you convey all the points mentioned in the Oral Consent Transcript in the same words. Indicate the approximate time the interview will take. If the farmer has written records encourage him/her to refer to these, especially if the contract farmer has passbooks. Make sure the farmer has a chance to clarify his/her doubts and give consent before you start the interview.]

Name of the Investigator	Date of Interview	
FARMER ID: (Copy from the Sampling Sheet after verifying identity of the farmer)		
Hamlet	Panchayat	Revenue Village
Block	Taluk	District

A.LANDHOLDING AND CROPPING PATTERN

1. *[Investigator: This is a confirmatory question*] What is the main occupation of your household in the last 1 year or 365 days?
   1) Casual Agricultural Labour
   2) Casual Non-Agricultural Labour
   3) Cultivation
   4) Other Self-employed
   5) Salaried employment
   6) Other (specify) _____

2. How much land does your household currently **operate?** (a)Owned _____ cents / acres / kuzhi
   (b) Leased _____ cents /acres /kuzhi

   1. What proportion of your land is irrigated? _____ %
   2. What is the **main** source of irrigation?
      1) Well
      2) Tubewell
      3) River
      4) Canal
      5) Rainfed
      6) Other (specify) _____

3. Compared to other farmers' lands in your village, would you say that the agricultural land you own is
   1) More fertile
   2) Equally (or just as) fertile
   3) Less fertile

4. What has been the cropping pattern ***this past year***? [*Investigator: Include land left fallow*]

1=Trader, 2=Pre-harvest Contractor, 3= Direct to consumer, 4= Contract (Intermediary), 5=Contract (Firm), 6=Self Consumption

	(A) Crop [Investigator: Include tree crops as well e.g., coconut, banana]	(B) Month of Sowing (for crops other than trees).	(C) Month of Harvest (for crops other than trees	(D) Area (in acres/centskuzhi) Note units	Quantity Produced (E) (Please note units)	Quantity Sold (F) (Please note units)	(G) Marketing Channel
1							
2							
3							
4							
5							
6							

5. Do you have contact with other farmers who pursue contract farming, in this crop or in other crops? Yes / No

➔**If YES,**

i. Which crops?

(1) Papaya (2) Gherkins (3) Marigold (4) Poultry (5) Other (specify)_____

ii. Are these

1. Relatives /family in your village
2. Relatives/family in another village
3. Friends in this village
4. Friends elsewhere
5. Acquaintances in this village
6. Other (Specify)_____

6. Have you ever wanted to grow gherkins in the past?
   1) No, never wanted to grow gherkins
   2) Wanted to grow gherkins, but did not

Investigator: If the response is (1) go to SECTION 1, If the response is (2) proceed to SECTION (2)

SECTION 1

7. What are the reasons you have never wanted to grow gherkins?

1	Too much labour, family small	10	No profits
2	Labour cost is too high	11	No land, not enough, fragmented
3	Hired Labour availability is a problem	12	Time consuming
4	New crop, no experience with the crop	13	Soil conditions not suited
5	Ruins Health	14	Too much risk
6	Soil deterioration	15	Too poor, unable to make the necessary investments
7	No irrigation facility	16	Will not be able to deliver the crop as they require
8	No faith /trust in the companies	17	Family Constraints, e.g. death in the family, etc.
9	Not Aware of the crop		

SECTION 2:

8. Have you ever been approached or by THE FIRM or approached THE FIRM in order to contract?
   1) Yes
   2) N0

➔ **(1)** If **YES**, why do you think you were unable to contract?

1	Too much labour, family small	10	No profits
2	Labour cost is too high	11	No land, not enough, fragmented
3	Hired Labour availability is a problem	12	Time consuming
4	New crop, no experience with the crop	13	Soil conditions not suited
5	Ruins Health	14	Too much risk
6	Soil deterioration	15	Too poor, unable to make the necessary investments
7	No irrigation facility	16	The firm only chooses people they know /have contact already
8	No faith /trust in the companies	17	Will not be able to deliver the crop as they require
9	Not Aware of the crop	18	Family Constraints,e.g. death in the family, etc.

➔ **(2)** If NO, why was it the case?

1	Too much labour, family small	10	No profits
2	Labour cost is too high	11	No land, not enough, fragmented
3	Hired Labour availability is a problem	12	Time consuming
4	New crop, no experience with the crop	13	Soil conditions not suited
5	Ruins Health	14	Too much risk
6	Soil deterioration	15	Too poor, unable to make the necessary investments
7	No irrigation facility	16	The firm only chooses people they know /have contact already
8	No faith /trust in the companies	17	Will not be able to deliver the crop as they require
9	Not Aware of the crop	18	Family Constraints,e.g. death in the family, etc.

9. Supposing you were to decide to grow gherkins today what **crop would you give up? (specify)**_____

[Investigator: The farmer might have difficulty in answering this question. The key is to ascertain the closest substitute to the contract crop, according to the farmer – i.e., the next best alternative.]

C.ELICITING EXPECTATIONS FROM THE FARMER

10. What are your expectations from growing that crop? If you were to follow the same set of procedures, and assuming the general conditions in your family, village and weather are unchanged, out of 20 seasons growing the contract crop in a plot of your choice, which has the same qualities, what is the number of occasions you would attain the minimum/ the most likely / the maximum price/yield/net income per acre of the commodity?

Variable	Unit Please note unit Rs/kg, quintal./acre for yield, etc.	What is the **minimum** value you expect?	What is the most likely value?	What is the **maximum** value you expect?	If I give you these 20 tokens and ask you to give the most tokens to the number you have said is most likely, the next most tokens you think is the next most likely and the least tokens to the least likely.		
					Number against **Minimum** Value?	Number against the **most likely** value?	Number against **maximum** value
Price expectation							
Yield expectation							
■**Net Income**							

[Investigator: Write number of tokens in the blank. To check for their understanding, (1) they should at least assign a token to each of the three outcomes they earlier proposed and (2) the most likely outcome should have the most tokens]

11. What other risks/benefits that you associate **with the alternate crop?** [*Investigator*: Please pay careful attention to this set of questions. This pertains only to the **alternate** crop**.** To start with **do not prompt**. Let the farmer mention the risks/benefits first. Once the box has been filled out, then read out the options the farmer has not mentioned to verify that they are not considered risks/benefits by the farmer. If the farmer is reluctant to answer these set of questions, then try prompting with examples of risks/benefits.]

Type of Risk/Benefit [investigator: The term used differs across regions, make sure you find out what term to use] (A)	Is this risk/benefit present? [Investigator: Write 1 if YES, 0 if NO] (B)	How important do you think each of these risks/benefits is to your well-being? *[Rank on a scale of 0-10 with 0 means not important to you at all, 10 means it is extremely important to you] (C)*	How frequently do you face this situation? *[In 10 seasons, how many times do you feel this event will occur? Note for those who are contracting for the first time, this is difficult.]*
(1)Risk of non-availability of credit			
(2) Risk of non-availability of technical advice			
(3) Risk of poor quality inputs			
(4) Risk of non-availability of inputs			
(5) Non availability of hired labour			
(6) Not finding a buyer			
(7) Delay in payment			
(6) Rejection of produce			
(7) Weather risk/ yield			
(8) Price risk, price drop			
(9) Others _____			

BENEFITS			
Positive Price Risk, price rise			
Can sell anytime, flexibility			
Quality is not critical			
Known trader in the market			
Positive yield risk			
Others 1 (specify) _____			

12. What are your expectations regarding earnings and yield of **gherkins** if you were to sow it this season? We would like to learn about your expectations regarding earnings and yield of gherkins. If you were to follow the same set of procedures, with the same firm and field officer, under the same contractual terms and assuming the general conditions in your family, village and weather are unchanged, out of 20 seasons growing the contract crop in a plot of your choice, which has the same qualities, what is the number of occasions you would attain the minimum/ the most likely / the maximum price/yield/net income per acre of the commodity?

Variable	Unit Please note unit Rs/kg, quintal./acre for yield, etc.	What is the **minimum** value you expect?	What is the most likely value?	What is the **maximum** value you expect?	If I give you these 20 tokens and ask you to give the most tokens to the number you have said is most likely, the next most tokens you think is the next most likely and the least tokens to the least likely.		
					Number against Minimum Value?	Number against the most likely value?	Number against **maximum** value
Price (unit value) [Since gherkins has many grade, the focus here is on eliciting an average unit value as "price."]	Rs./kg.						
Yield							
■Net Income							

13. What, in your opinion, are the most important risks/benefits associated with contracting? [*Investigator*: Please pay careful attention to this set of questions. This pertains only to the **gherkins.** To start with **do not prompt**. Let the farmer mention the risks/benefits first. Once the box has been filled out, then read out the options the farmer has not mentioned to verify that they are not considered risks/benefits by the farmer. If the farmer is reluctant to answer these set of questions, then try prompting with examples of risks/benefits.]

Type of Risk/Benefit [investigator: The term used differs across regions, make sure you find out what term to use]	Is this risk/benefit present? [*Investigator: Let the farmer list the risks. DO NOT PROMPT. If the farmer mentions a risk, write 1 against it, if not mark 0. Then move to the next column]*	How important do you think each of these risks/benefits is to your well-being? *[Rank on a scale of 0-10 with 0 means not important to you at all, 10 means it is extremely important to you.]*	What is the probability of the following event happening in contracting with THE "FIRM" *[If you contract 10 times how many times do you feel this event will occur.]*
Yield risk			
Price risk			
Risk of firm not coming back to pick up the produce at harvest time.			
Risk of delay in payment			
Risk of non-availability of credit			
Risk of non-availability of inputs			
Risk of poor quality inputs			
Risk of wrong technical advice			
Risk of rejection/downgrading of produce by the firm, quality			
Risk of the firm not coming to contract in the future			
Risk of losing land			
Others 1 (specify) _____			
Others 2 (specify) _____			
BENEFITS			
Inputs provided by the firm on credit			
Advance provided by firm			
Credit available against contract			
Technical advice available			
Lumpsum payment			
Timely payment			
Price fixed, certainty			
Reduced transaction time			
Assured buyer			
Positive yield risk			
Farm-gate collection			
Others 1 (specify) _____			

E.COST AND RETURNS FROM NON-CONTRACT CROP [For this section, data should pertain to the previous COMPLETED season.]

14. Could you give some details of your cultivation **this past season**?

Operations	Labour Cost							Input/output		
	Male(days)		Female(days)		Labour cost for hired		Machine (hr)	Quantity	Unit price	Source (1=Purchased; 2=Owned: 3=Company Provided
	Hired	Family	labour Hired	Family	Male	Female				
Variable cost										
1. Land preparation										
2. Seed bed preparation										
3. FYM/Compost										
4. Planting/sowing										
5. Seeds										
6. Seed treatment										
7. Fertilizer application										
8. Micro nutrient application										
9. Interculture operation										
10. Weeding/weedicide application										
11. Plant protection chemicals										
12. Irrigation										
13. Harvesting										
14. Equipment repair and maintenance										
TRANSACTIONS COST										
15. Post harvest operations										
16. Packing and Sorting										
17. Transport to the Market/Collection Center										
18. Commission on transaction										
19. Interest on working capital @7%										
Fixed cost										
1. Land rent										
2. Depreciation on farm assets										
3. Interest on fixed capital 12%										
Total cost										
Main product yield										
By product yield										
Gross return										
Net return										

15. What is the volume of product rejected as not meeting quality standards? _____ kgs

16. What is the volume of product that was lost due to spoilage /wastage? _____ kgs

17. How many days did it take for you to receive full payment after completion of the transaction? _____days

MODULE ON AWARENESS AND PERCEPTIONS

18. In general, how much power to voice your opinions do you feel farmers have in this relationship with the company? [Investigator: Read out all the options. Circle only one. If the farmer elaborates, note his/her response below]
    1) Very powerful
    2) Somewhat powerful
    3) Neither powerful nor powerless
    4) Somewhat powerless/vulnerable
    5) Completely powerless/vulnerable

19. Today, how risky do you think contracting with THE FIRM is?
    [Investigator: Rank on a scale of 0 to 10; 0 means no risk at all, 10 means extremely risky] _____

20. What, according to you, are the chances that ***the company will want to start contracting with you*** within the next three years?
    (1) Almost certainly (2) Very likely (3) Somewhat likely (4) Unlikely (5) Not at all likely

21. What, according to you, are the chances that ***you will want to start contracting*** with this firm within the next three years?
    (1) Almost certainly (2) Very likely (3) Somewhat likely (4) Unlikely (5) Not at all likely

22. For the next season, do you plan to go in for gherkins cultivation?
    (1) Yes (2) No (3) Have not decided yet / Unable to say

23. Taken all together, how would you say things are for you these days: would you say you are: _____
[Inv: 1=Very Happy, 2=Pretty happy, 3=Not too happy]

I. SOCIO-ECONOMIC STATUS OF THE HOUSEHOLD

24. What is the age of the head of the household? _____years

25. How many members are there in your nuclear family? _____

    1. Of these, the number of members in the age group 0-15 years of age? _____

26. What is your social group?
    1. SC/ST
    2. MBC
    3. OBC
    4. Others (specify) _____

27. What is the education level you have attained?
    1) Illiterate
    2) Literate (below primary)
    3) Primary (Class V complete)
    4) Upper Primary Class (Class VIII complete)
    5) Secondary (Class X complete)
    6) High School (Class XII complete)
    7) Others (specify) _____

28. What is the education level of the most educated member of the household?
    1) Illiterate
    2) Literate (below primary)
    3) Primary (Class V complete)
    4) Upper Primary Class (Class VIII complete)
    5) Secondary (Class X complete)
    6) High School (Class XII complete)
    7) Others (specify) _____

29. We would like to know your asset position. Does the household own any of the following items? [Investigator: Write the number of pieces of the object if applicable and 0 if not applicable]

	ASSET TYPE	**Currently possesses (write Qty and units)**
a.	Radio	
b.	Telephone Landline	
c.	Mobile	
d.	TV	
e.	Watch	
f.	Pressure cooker	
g.	Bicycle	
h.	Scooter/ Motorcycle	
i.	Livestock	
j.	Poultry	
k.	Tractor	

30. What is your main source of light now? ___ _____
[Inv.:1=Kerosene; 2=Candle; 3=Electricity; 4=Electricity with inverter; 5=Solar energy; 6=LPG/biogas; 7=Battery (torch); 8=Diesel generator; 9=Other, specify_____]

31. What is your main source of heat for cooking now? _____
[Inv.1=Wood/charcoal; 2=Kerosene; 3=Electricity; 4= LPG/biogas; 5=Crop residues; 6=Other, specify_____]

32. What is your main source of drinking water? _____
[Inv: 1=River/canal; 2=Public well; 3=Public handpump; 4=Own handpump; 5=Own motorpump or other waterlifting devices; 6=Piped water; 7=Rainwater; 8=Water filling station; 9=Other, specify:_____]

33. What were your main sources of income in the **past one year** ? *[Attempt to get the value in Rs. If this is difficult or the farmer is vague about it, try to record the percentage of annual income from each source.]*

1. Cultivation _____
2. Wage labour in Agriculture _____
3. Wage labour off farm _____
4. Self Employment _____
5. Transfers and Remittances _____

34. What proportion of household foodgrain consumption do you buy from outside (e.g. ration shop)? _____%

35. How much of outstanding debt do you have at the moment? Rs. _____

J. MEASURING RISK AVERSION AND AMBIGUITY AVERSION

Risk Aversion

36. You have the choice of (1) accepting Rs. 150 from us right now for sure. (2) Or alternatively, instead of the Rs. 150, we will toss a coin, if it is heads you get Rs.210 and if it is tails, you get Rs.90.

What would you rather choose to do? (write 1 or 2)	
Write amount _____	

Ambiguity Aversion

37. Now, we would like to offer you another chance to win. We would like to offer you Rs.150 through another game

Bag 1 contains 4 white balls and 6 black balls. You pick a ball. You will win Rs.150 if the ball you pick is white.

Bag 2 contains 10 balls. Some are white and some are black. I don't know for sure how many of each there are. You need to name one color. And you will win Rs.150 if you pick the ball of the color you name.

Which bag will you choose? (write 1 or 2)	

Enumerator: Please allow the respondent to pick a ball from his chosen bag

The reward from this game is	

Lottery Price

38. Supposing you were offered a lottery ticket, where the prize is decided by a coin flip. You win Rs. 300 if Heads and 150 if Tails. What is the maximum you would be willing to pay for the lottery ticket?

Rs. _____

K. INVESTIGATOR OBSERVATIONS

39. LOCATIONAL ATTRIBUTES

a. Distance of the farmer's field from the collection point _____ metres

b. Distance of the farmer's field from the nearest metalled roadhead _____ metres

c. Distance of the farmer's field from the nearest market for contract crop _____ metres

d. Distance of the farmer's field from the nearest market for the **alternate** crop _____ metres

e. Distance of the farmer's house from the panchayat president's house _____ metres

f. Distance of the farmer's house from the main village cluster/centre of village _____ metres

40. House Type
    1) Kaccha (Odu, mud)
    2) Pacca (Cement brick)

41. How would you rate the economic condition of this household compared to other households in the village?
    1) Among the poorest 20%
    2) Poorer than average but not among the poorest 20%
    3) About Average
    4) Better than average but not among the richest 20%
    5) Among the richest 20%
    6) Unable to observe

MAKE NOTE OF ANY QUOTES, COMMENTS, OR INCIDENTS THAT YOU THINK ARE RELEVANT AND INTERESTING. PLEASE MAKE NOTE OF IT IN SOME DETAIL.

Schedule 2(B): OTHER MARIGOLD FARMER QUESTIONNAIRE

[Investigator: <u>The farmer MUST be growing marigold and never contracted..</u> Interview the head of the farm household in the list of selected farmers. If the farmer is unavailable, do not interview anyone else in the household. Introduce yourself and explain the purpose of the survey. Make sure you convey all the points mentioned in the Oral Consent Transcript in the same words. Indicate the approximate time the interview will take. If the farmer has written records encourage him/her to refer to these, especially if the contract farmer has passbooks. Make sure the farmer has a chance to clarify his/her doubts and give consent before you start the interview.]

Name of the Investigator	Date of Interview	
FARMER ID: (Copy from the Sampling Sheet after verifying identity of the farmer)		
Hamlet	Panchayat	Revenue Village
Block	Taluk	District

A.OCCUPATION & LANDHOLDING

1. *[Investigator: This is a confirmatory question*] What is the main occupation of your <u>household</u> in the last 1 year or 365 days?
    1) Casual Agricultural Labour
    2) Casual Non-Agricultural Labour
    3) Cultivation
    4) Other Self-employed
    5) Salaried employment
    6) Other (specify) _____

2. How much land does your household currently **<u>operate?</u>** (a)Owned _____ cents / acres / kuzhi
    (b) Leased _____ cents /acres /kuzhi

    1. What proportion of your land is irrigated? _____ %
    2. What is the **main** source of irrigation?
        1) Well
        2) Tubewell
        3) River
        4) Canal
        5) Rainfed
        6) Other (specify) _____

3. Compared to other farmers' lands in your village, would you say that the agricultural land you own is
    1) More fertile
    2) Equally (or just as) fertile
    3) Less fertile

What has been the cropping pattern ***this past year***? [*Investigator: Include land left fallow*]

	(A) Crop [Investigator: Include tree crops as well e.g., coconut, banana]	(B) Month of Sowing (for crops other than trees).	(C) Month of Harvest (for crops other than trees	(D) Area (in acres/centskuzhi) Note units	Quantity Produced (E) (Please note units)	Quantity Sold (F) (Please note units)	(G) Marketing Channel
1							
2							
3							
4							
5							
6							

1=Trader, 2=Pre-harvest Contractor, 3= Direct to consumer, 4= Contract (Intermediary), 5=Contract (Firm), 6=Self Consumption

4. How many years' experience do you have cultivating marigold, prior to this season? _____ years

5. Do you have contact with other farmers who pursue contract farming, in this crop or in other crops? Yes / No

➔**If YES,**

i. Which crops?

(1) Papaya (2) Gherkins (3) Marigold (4) Poultry (5) Other (specify)_____

ii. Are these

1. Relatives /family in your village
2. Relatives/family in another village
3. Friends in this village
4. Friends elsewhere
5. Acquaintances in this village
6. Other (Specify)_____

6. Have you ever been approached or by THE FIRM or approached THE FIRM in order to contract?
   1) Yes
   2) N0

7. Have you ever wanted to contract for marigold in the past?
   1) No, never
   2) Wanted to contract, but did not

8. What are the reasons you did not contract with FIRM?

1	The firm does not contract in this village	8	Low price for output
2	The firm did not approach me	9	Don't Know
3	I was not interested	10	Did not fulfil their eligibility criteria
4	They choose their own people	11	Other company was giving gifts, incentives for contracting
5	Did not have faith in the company	12	No advance given by the firm
6	People I know do not contract with FIRM	13	Personal reasons, death in the family, etc.
7	Improper Payment by FIRM		

9. How risky do you think contracting with FIRM is? [Rank on a scale of 0 to 10; 0=No risk at all, 10=Extremely Risky] _____

C. ELICITING EXPECTATIONS

10. We would like to learn about your expectations regarding earnings and yield of marigold. If you were to follow the same set of procedures, with the same firm and field officer, under the same contractual terms and assuming the general conditions in your family, village and weather are unchanged, out of 20 seasons growing the contract crop in a plot of your choice, which has the same qualities, what is the number of occasions you would attain the minimum/ the most likely / the maximum price/yield/net income per acre of the commodity?

Variable	Unit Please note unit Rs/kg, quintal./acre for yield, etc.	What is the **minimum** value you expect?	What is the most likely value?	What is the **maximum** value you expect?	If I give you these 20 tokens and ask you to give the most tokens to the number you have said is most likely, the next most tokens you think is the next most likely and the least tokens to the least likely.		
					Number against **Minimum** Value?	Number against the **most likely** value?	Number against **maximum** value
Price expectation							
Yield expectation							
■**Net Income**							

[Investigator: Write number of tokens in the blank. To check for their understanding, (1) they should at least assign a token to each of the three outcomes they earlier proposed and (2) the most likely outcome should have the most tokens]

11. What, in your opinion, are the most important risks/benefits associated with the open market? [*Investigator*: Please pay careful attention to this set of questions. This pertains only to the **marigold.** To start with **do not prompt**. Let the farmer mention the risks/benefits first. Once the box has been filled out, then read out the options the farmer has not mentioned to verify that they are not considered risks/benefits by the farmer. If the farmer is reluctant to answer these set of questions, then try prompting with examples of risks/benefits.]

Type of Risk/Benefit [investigator: The term used differs across regions, make sure you find out what term to use] (A)	Is this risk / benefit present? [Investigator: Write 1 if YES, 0 if NO] (B)	How important do you think each of these risks /benefitsis to your well-being? *[Rank on a scale of 0-10 with 0 means not important to you at all, 10 means it is extremely important to you] (C)*	How frequently do you face this situation? *[In 10 seasons, how many times do you feel this event will occur? Note for those who are contracting for the first time, this is difficult.]*
(1)Risk of non-availability of credit			
(2) Risk of non-availability of technical advice			
(3) Risk of poor quality inputs			
(4) Risk of non-availability of inputs			
(5) Non availability of hired labour			
(6) Not finding a buyer			
(7) Delay in payment			
(6) Rejection of produce			
(7) Weather risk/ yield			
(8) Price risk, price drop			
(9) Others _____			
BENEFITS			
Positive Price Risk, price rise			
Can sell anytime, flexibility			
Quality is not critical			
Known trader in the market			
Positive yield risk			
Others 1 (specify) _____			
Others 2 (specify) _____			

12. If you were not contracting for MARIGOLD with the FIRM this season, what would be your next best option? [Investigator: Read the option aloud and get the next best alternative – the name of the company and/or crop.]

    1) Marigold contracting for company (specify the name of company/agent)_____
        a. If this option were not available _____
    2) Another crop instead of marigold [Inv: Please note which crop you would have cultivated] _____

D. RISK PERCEPTIONS OF ALTERNATIVES [Choose MARIGOLD CONTRACTING as the relevant alternative]

13. Supposing you had opted to contract for marigold this season, if you were to follow the same set of procedures, assuming the general conditions in your family, village and weather are unchanged, out of 20 seasons growing the contract crop in a plot of your choice, which has the same qualities, what is the number of occasions you would attain the minimum/ the most likely / the maximum price/yield/net income per acre of the commodity? [Investigator: For the next few questions the alternative the farmer has mentioned above as the non-contract option]

14.

Variable	Unit Please note unit Rs/kg, quintal./acre for yield, etc.	What is the **minimum** value you expect?	What is the most likely value?	What is the **maximum** value you expect?	If I give you these 20 tokens and ask you to give the most tokens to the number you have said is most likely, the next most tokens you think is the next most likely and the least tokens to the least likely.		
					Number against Minimum Value?	Number against the most likely value?	Number against **maximum** value
Price expectation							
Yield expectation							
■**Net Income**							

15. What other risks/benefits that you associate **with marigold contracting?** Follow the same procedure as for the previous RISK/BENEFIT TABLE]

Type of Risk/Benefit [investigator: The term used differs across regions, make sure you find out what term to use]	Is this risk/benefit present? [*Investigator: Let the farmer list the risks.. If the farmer mentions a risk, write 1 against it, if not mark 0. Then move to the next column and retrace the intensity of feeling*]	How important do you think each of these risks/benefits is to your well-being? *[Rank on a scale of 0-10 with 0 means not important to you at all, 10 means it is extremely important to you. Write NA if it is not applicable,e.g. Group contracting]*	What is the probability of the following event happening in contracting with THE "FIRM" *[If you contract 10 times how many times do you feel this event will occur? Note for those who are contracting for the first time, this is difficult.]*
Yield risk			
Price risk			
Risk of firm not coming back to pick up the produce at harvest time or "incomplete procurement'			
Risk of delay in payment			
Risk of non-availability of credit			
Risk of non-availability of inputs			
Risk of poor quality inputs			
Risk of wrong technical advice			
Risk of exploitation by intermediary			
Risk of rejection/downgrading of produce by the firm, quality			
Risk of the firm not coming to contract in the future			
Risk of losing land			
Others 1 (specify) _____			
Others 2 (specify) _____			

Type of Risk/Benefit [investigator: The term used differs across regions, make sure you find out what term to use]	Is this risk/benefit present? [*Investigator: Let the farmer list the risks.. If the farmer mentions a risk, write 1 against it, if not mark 0. Then move to the next column and retrace the intensity of feeling*]	How important do you think each of these risks/benefits is to your well-being? *[Rank on a scale of 0-10 with 0 means not important to you at all, 10 means it is extremely important to you. Write NA if it is not applicable,e.g. Group contracting]*	What is the probability of the following event happening in contracting with THE "FIRM" *[If you contract 10 times how many times do you feel this event will occur? Note for those who are contracting for the first time, this is difficult.]*
BENEFIT			
Inputs provided by the firm on credit			
Advance provided by firm			
Credit available against contract			
Technical advice available			
Lumpsum payment			
Timely payment			
Price fixed, certainty			
Reduced transaction time			
Assured buyer			
Positive yield risk			
Farm-gate collection			
Others 1 (specify) _____			

E. COST AND RETURNS FROM MARIGOLD CULTIVATION FOR OPEN MARKET [For this section, data should pertain to the previous completed season.]

16. Could you give some details of your cultivation **this past season**?

Operations	Labour Cost						Machine (hr)	Input/output		
	Male(days)		Female(days)		Labour cost for hired			Quantity	Unit price	Source (1=Purchased; 2=Owned: 3=Company Provided
	Hired	Family	labour Hired	Family	Male	Female				
Variable cost										
1. Land preparation										
2. Seed bed preparation										
3. FYM/Compost										
4. Planting/sowing										
5. Seeds										
6. Seed treatment										
7. Fertilizer application										
8. Micro nutrient application										
9. Interculture operation										
10. Weeding/weedicide application										
11. Plant protection chemicals										
12. Irrigation										
13. Harvesting										
14. Equipment repair and maintenance										
TRANSACTIONS COST										
15. Post harvest operations										
16. Packing and Sorting										
17. Transport to the Market/Collection Center										
18. Commission on transaction										
19. Interest on working capital @7%										
Fixed cost										
1. Land rent										
2. Depreciation on farm assets										
3. Interest on fixed capital 12%										
Total cost										
Main product yield										
By product yield										
Gross return										
Net return										

17. What is the volume of product rejected as not meeting quality standards? _____ kgs

18. What is the volume of product that was lost due to spoilage /wastage? _____ kgs

19. How many days did it take for you to receive full payment after completion of the transaction? _____days

G. RELATIONSHIP INTENSITY & TRUST

20. In general, how much power to voice opinions do you feel contract farmers have in their relationship with the company? [Investigator: Read out all the options. Circle only one. If the farmer elaborates, note his/her response below]
    a) Very powerful
    b) Somewhat powerful
    c) Neither powerful nor powerless
    d) Somewhat powerless/vulnerable
    e) Completely powerless/vulnerable

21. What, according to you, are the chances that the *company starts contracting with you* within the next three years?
    (1) Almost certainly (2) Very likely (3) Somewhat likely (4) Unlikely (5) Not at all likely

22. What, according to you, are the chances that *you will want to start contracting* with this firm within the next three years?
    (1) Almost certainly (2) Very likely (3) Somewhat likely (4) Unlikely (5) Not at all likely

23. The last time sold marigold in the local market, was the local market price, on an average, higher or lower than the contract price?
    1. Contract price was lower
    2. About the same
    3. Contract price was higher

    Contract Price (in Rs/kg.)_____ Market Price (in Rs./kg)_____

24. Would you accept a contract that offered you a lower price than the market price? Yes / No / Unsure

➔If YES, how much lower can it be before you reject the contract?

If the market price is Rs.10/kgm Contract price can be Rs._____/kg / Unsure

If the market price is Rs.6/kgm Contract price can be Rs._____/kg / Unsure

If the market price is Rs.2/kgm Contract price can be Rs._____/kg / Unsure

➔If NO, how much higher would the contract price have to be above the market price for you to accept the contract?

If the market price is Rs.10/kgm Contract price should be at least Rs. _____/kg / Unsure

If the market price is Rs. 6/kgm Contract price should be at least Rs. _____/kg / Unsure

If the market price is Rs.2/kgm Contract price should be at least Rs. _____/kg / Unsure

25. For the next season, do you plan to bring more area under marigold or less?
    (1) Will increase area (2) Will maintain the same area (3) Will decrease the area (4) Have not decided yet

26. Taken all together, how would you say things are for you these days: would you say you are: _____
[Inv: 1=Very Happy, 2=Pretty happy, 3=Not too happy]

I. SOCIO-ECONOMIC STATUS OF THE HOUSEHOLD

27. What is the age of the head of the household? _____years

28. How many members are there in your nuclear family? _____

    1. Of these, the number of members in the age group 0-15 years of age? _____

29. What is your social group?
    1. SC/ST
    2. MBC
    3. OBC
    4. Others (specify) _____

30. What is the education level you have attained?
    1) Illiterate
    2) Literate (below primary)
    3) Primary (Class V complete)
    4) Upper Primary Class (Class VIII complete)
    5) Secondary (Class X complete)
    6) High School (Class XII complete)
    7) Others (specify) _____

31. What is the education level of the most educated member of the household?
    1) Illiterate
    2) Literate (below primary)
    3) Primary (Class V complete)
    4) Upper Primary Class (Class VIII complete)
    5) Secondary (Class X complete)
    6) High School (Class XII complete)
    7) Others (specify) _____

32. We would like to know your asset position. Does the household own any of the following items? [Investigator: Write the number of pieces of the object if applicable and 0 if not applicable]

	ASSET TYPE	**Currently possesses (write Qty and units)**
a.	Radio	
b.	Telephone Landline	
c.	Mobile	
d.	TV	
e.	Watch	
f.	Pressure cooker	
g.	Bicycle	
h.	Scooter/ Motorcycle	
i.	Livestock	
j.	Poultry	
k.	Tractor	

33. What is your main source of light now? ___ _____
[Inv.:1=Kerosene; 2=Candle; 3=Electricity; 4=Electricity with inverter; 5=Solar energy; 6=LPG/biogas; 7=Battery (torch); 8=Diesel generator; 9=Other, specify_____]

34. What is your main source of heat for cooking now? _____
[Inv.1=Wood/charcoal; 2=Kerosene; 3=Electricity; 4= LPG/biogas; 5=Crop residues; 6=Other, specify_____]

35. What is your main source of drinking water? _____
[Inv: 1=River/canal; 2=Public well; 3=Public handpump; 4=Own handpump; 5=Own motorpump or other waterlifting devices; 6=Piped water; 7=Rainwater; 8=Water filling station; 9=Other, specify:_____]

36. What were your main sources of income in the **past one year** ? *[Attempt to get the value in Rs. If this is difficult or the farmer is vague about it, try to record the percentage of annual income from each source.]*

    1. Cultivation _____
    2. Wage labour in Agriculture _____
    3. Wage labour off farm _____
    4. Self Employment _____
    5. Transfers and Remittances _____

37. What proportion of household foodgrain consumption do you buy from outside (e.g. ration shop)? _____%

38. How much of outstanding debt do you have at the moment? Rs. _____

J. MEASURING RISK AVERSION AND AMBIGUITY AVERSION

Risk Aversion

39. You have the choice of (1) accepting Rs. 50 from us right now for sure. (2) Or alternatively, instead of the Rs. 50, we will toss a coin, if it is heads you get Rs.70 and if it is tails, you get Rs.30.

What would you rather choose to do? (write 1 or 2)	
Hand over Rs. 50 to the farmer or toss the coin and pay out Rs. 70 if Heads and Rs.30 if Tails. Write amount _____	

Ambiguity Aversion

40. Now, we would like to offer you another chance to win. We would like to offer you Rs.50 through another game

Bag 1 contains 4 white balls and 6 black balls. You pick a ball. You will win Rs.50 if the ball you pick is white.

Bag 2 contains 10 balls. Some are white and some are black. I don't know for sure how many of each there are. You need to name one color. And you will win Rs.50 if you pick the ball of the color you name.

Which bag will you choose? (write 1 or 2)	
Enumerator: Please allow the respondent to pick a ball from his chosen bag	
The reward from this game is	

Lottery Price

41. Supposing you were offered a lottery ticket, where the prize is decided by a coin flip. You win Rs.100 if Heads and 50 if Tails. How much would you be willing to pay for the ticket? [Investigator: Suggest lottery prices of Rs. 25, Rs.50, Rs. 75 and so on to get this figure.]

Rs. _____

K. INVESTIGATOR OBSERVATIONS

42. LOCATIONAL ATTRIBUTES

a. Distance of the farmer's field from the collection point _____ metres

b. Distance of the farmer's field from the nearest metalled roadhead _____ metres

c. Distance of the farmer's field from the nearest market for contract crop _____ metres

d. Distance of the farmer's field from the nearest market for the **alternate** crop _____ metres

e. Distance of the farmer's house from the panchayat president's house _____ metres

f. Distance of the farmer's house from the main village cluster/centre of village _____ metres

43. House Type
    1) Kaccha (Odu, mud)
    2) Pacca (Cement brick)

44. How would you rate the economic condition of this household compared to other households in the village?
    1) Among the poorest 20%
    2) Poorer than average but not among the poorest 20%
    3) About Average
    4) Better than average but not among the richest 20%
    5) Among the richest 20%
    6) Unable to observe

MAKE NOTE OF ANY QUOTES, COMMENTS, OR INCIDENTS THAT YOU THINK ARE RELEVANT AND INTERESTING. PLEASE MAKE NOTE OF IT IN SOME DETAIL.